PRICE 50 CENTS

SEPTEMBER 28, 1953

American Machinist

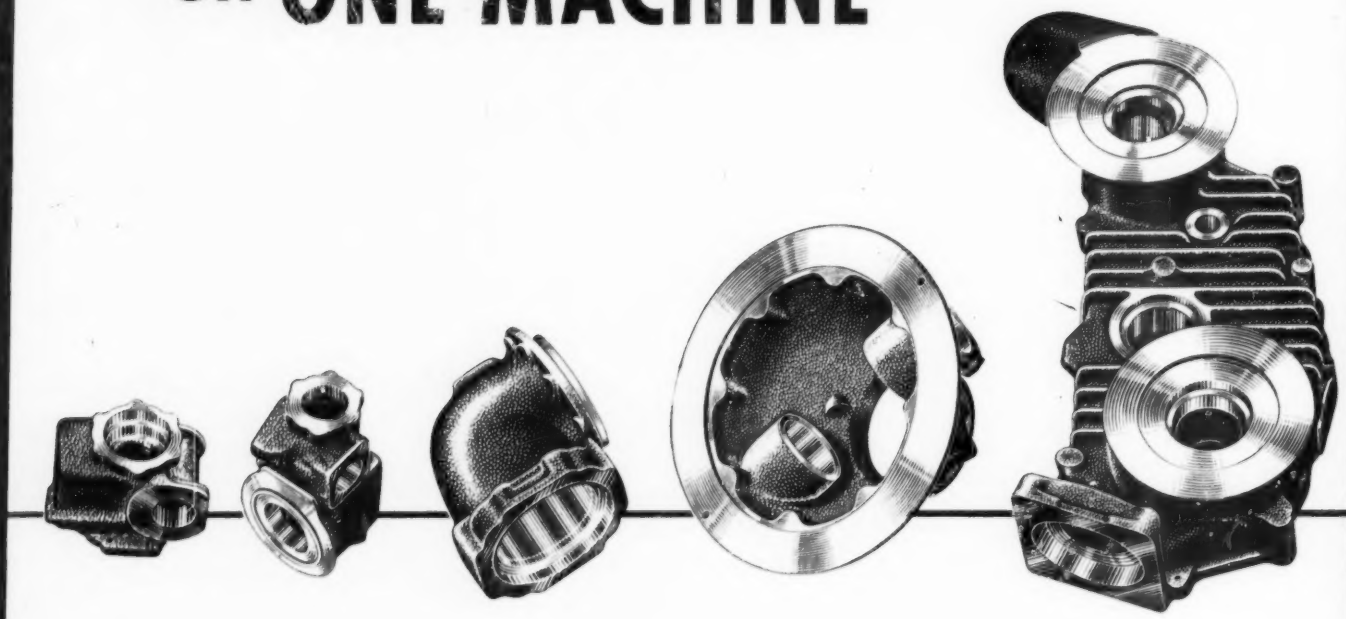
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

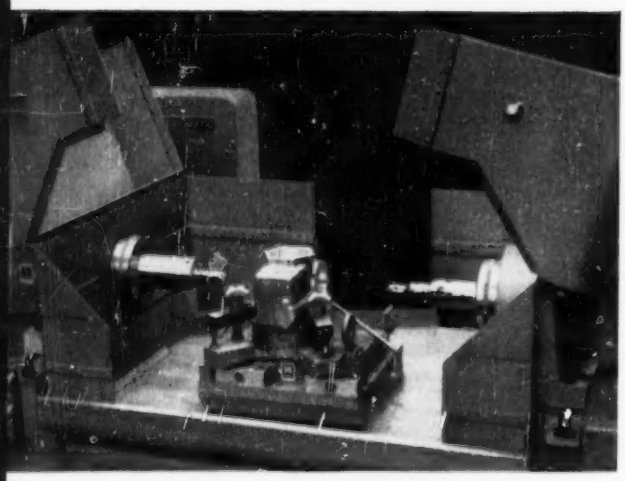
35-ton welding jig
see page 2

CRYSTAL STRUCTURE FOR THE SHOP . . . a Special Report

HIGH-RAKE MILLING . . . a Progress Report

How to raise a family of five on ONE MACHINE





● On long-run production jobs, the speed, precision and economy of Heald Borizing has become almost a tradition. But what about short-run work on a variety of parts? Here, too, the versatile Heald Bore-Matic can give you faster, better production, at lower cost per part!

Here's a typical example. The Model 322 Bore-Matic shown at the left finishes FIVE different jet engine parts — each with a different fixture and tooling setup. Interchangeable fixtures are platen or angle plate type, as required. In some cases, adapters are used to permit one fixture to accommodate more than one part. Aligning rails help to locate the different fixtures quickly and easily. Both roughing or semifinishing and finishing are done with maximum speed and economy on this one Heald machine.

Long Runs or Short — when it comes to precision finishing, it pays to come Heald.

Internal and Rotary
Surface Grinding Machines
and Bore-Matics

HEALD

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

CONTENTS FOR SEPTEMBER 28, 1953 VOL 97 NO. 20

ADMINISTRATION

115 EDITORIAL *Burnham Finney*
149 BACKWARD FOREMAN *Round Table*

SPECIAL REPORT

133 HIGH-RAKE MILLING: A PROGRESS REPORT *E J Tangerman*
139 HOW CRYSTAL STRUCTURE AFFECTS METALFORMING *Samuel Storchheim*

ENGINEERING

122 HOW TO GRIND CARBIDES SIX TIMES FASTER *John A Mueller*
159 BUTTRESS SCREW THREADS

MATERIALS HANDLING

117 SIMPLIFY STUDEBAKER'S CHIP HANDLING *Otto Klausmeyer*
150 FLEXIBLE PIPE REPLACES CHUTE *Harry Welsbacher*

MATERIAL CUTTING, FORMING

152 STRAIGHTEN COILED WIRE *B Erteschik*
153 WAX IMPROVES ALUMINUM SAWING *C J Filz*
153 REAMER LIKE HALF-DRILL *W G Holmes*
157 BELT LENGTHS *D E Sweet*

TOOLING

126 LAYOUT OF DEEP-DRAWN SHELLS FOLLOWS CERTAIN STEPS *Stanley R Cope*
130 FIVE POWER PARTS FOR POWER STEERING *Charles Emerson*
150 TAPER CHECKING GAGE *Haim Murro*
151 METHOD FOR INDIRECT GAGING *R H Fry*
151 COMPARATOR FOR OVERSIZE PARTS *R H Fry*
152 MEASURE HALF-BORES *A Whitely*
153 HOMEMADE FACEMILL *R Vandebeginne*
153 COLLET ADAPTER *H D Rhodenbaugh*

NEWS OF METALWORKING

101 SPOT NEWS
103 WASHINGTON
105 DETROIT
107 MACHINE TOOLS
111 GAGING METALWORKING
172 NAMES IN THE NEWS

DEPARTMENTS

94 BACKLASH
150 PRACTICAL IDEAS
157 REFERENCE BOOK SHEETS
163 TALKING SHOP
174 EQUIPMENT, MATERIALS, PARTS
179 NEW BULLETINS
204 TANGENTS
210 ROUND TABLE DISCUSSION
238 NEW BOOKS

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chips

FILLING . . . Our front-cover transparency shows the welding up of minor defects in a 71,000-lb cast-steel hydraulic-turbine runner mounted on a tilting table in the Allis-Chalmers tank and plate shops. After this comes final machining, then the runner becomes part of the third 91,500-hp unit to go into TVA's Fontana plant, to run at 150 rpm under 330-ft head.

CRYSTAL STRUCTURE . . . Sam Storchheim, senior metallurgist at the Bayside (NY) plant of Sylvania Electric Products Inc, provides another in his series on simplified metallurgy. This one covers crystal structure, and how it affects workability of metals—until now a very complicated idea, but one shopmen must know about in these days of complex alloys.

HIGH RAKE . . . Three and a half years ago, we told you about an interesting idea for milling tough parts faster. Now we bring the story up to the minute by combining reports from several sources in a 6-page foldout insert. There's fundamental research by Cincinnati Milling, cutting tests by General Electric, and shop practice at La-Pointe—all on high-rake milling—plus a report of first tests on high-helix milling of titanium. As before, the data are new—and exclusive.

SIX TIMES FASTER . . . Electrolytically assisted grinding appears to be one of the best and fastest ways to grind carbide with maximum diamond economy. We first told you about it 20 months ago, and have since provided added data as it was developed. Now we present a further progress report, this time from Carborundum, on setting up a standard tool grinder with metal-bonded diamond wheels. Wheel wear was only 1% that of conventional grinding.

POWER STEERING . . . To keep you abreast of the latest in tooling for powdered-metal parts, we describe five parts for new automotive power-steering units, and show how they're made. Tooling is the key, as usual. The job is done at Michigan Powder-Metal Parts Div, Northville.

CHIP HANDLING . . . Keeping up with our reports on the burgeoning of chip handling, our lead article describes the new setup at Studebaker. For the fundamentals, go back to our Special Report of May 11; it will be worth the trip.

PRESS FOG . . . Mist, fog, or spray application of cutting fluids was the subject of our last-issue Special Report. In this issue is the first description of another application of the same idea—fog lubrication of press dies. It beats the time-honored swab a mile, saves lube over the current idea of lubricating the sheet all over.

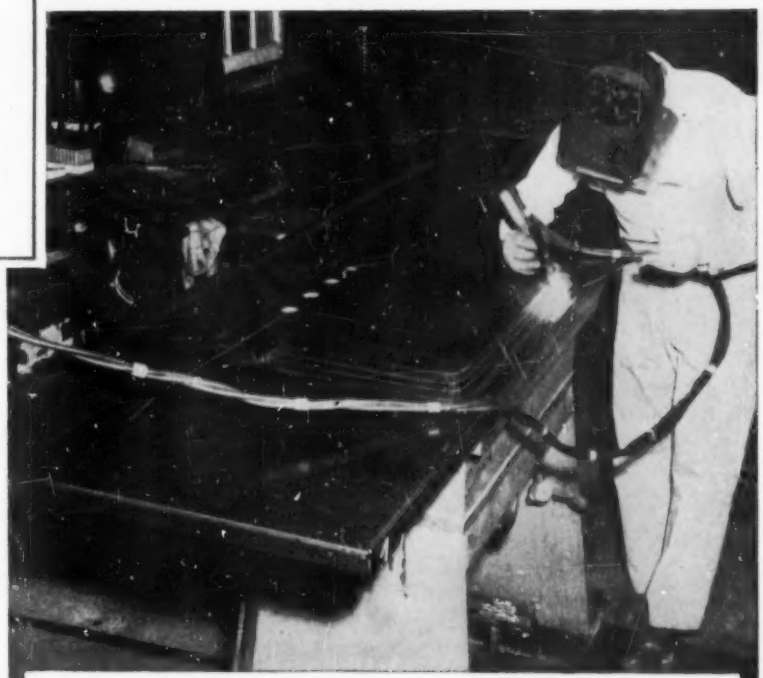
COMING . . . Oct 12 *AM* is our Annual Metal Show Number. We'll have our Show-in-Print descriptions of new items at the Show in Cleveland the next week, of course, but instead of a series of articles for the rest of the issue, we'll have one super-colossal Special Report. It will be four times the usual length — 64 pages — and will describe one company's reasons for and results of modernization. You haven't seen anything like it before, even in *AM*.

Electrolytic Ass't . . . John A Mueller started out in life with a bachelor of arts from Canisius College, but went on to get an engineering degree from Rensselaer Polytechnic Institute. He has had eleven years of experience in the abrasives industry, is currently manager of the Mechanical Laboratory Department, Sales Engrg Branch, Carborundum Company, Niagara Falls, NY. He began with Carborundum as a research man, and it is his research report that appears in this issue. The subject is electrolytically assisted grinding, on which he gives latest data.

SOME ANSWERS TO YOUR SHOP QUESTIONS ON

welding straight-chromium Stainless Steels

This is another in a series of advertisements discussing the straight-chromium grades of Stainless Steel from the standpoint of fabricating performance. Other operations that will be considered in future discussions are machining, cutting, spinning and finishing.



Welding Type 430 bowls to Type 430 sink tops

Geneva Modern Kitchens, Geneva, Ill., is using Type 430 Stainless Steel in its line of kitchen sinks. Here a drawn sink bowl is being welded to the sink top by the electric arc method. After welding, the tops are finished by grinding.

MOST of the common commercial methods of welding can and are being applied successfully in the fabrication of straight-chromium grades of Stainless Steel. Methods being used include torch, arc, spot and resistance welding.

Welding temperatures should be kept as low as possible, since straight-chromium grades have a tendency toward grain growth which heat-treatment may not correct. It has been found that, in heavy sections, numerous small beads followed by annealing often gives the best results.

Tendency toward warping and movement in welding is minimized by the low coefficient of expansion of Type 430 straight-chromium Stainless Steel.

Wherever feasible, it is recommended that the welding rods you use be of nickel-bearing grades of Stainless Steel. But where color match is important, welding rods of a straight-chromium grade can be used successfully, especially when the weld is to be annealed.

Our representatives can help you with welding problems that you may encounter in using U·S·S 17 (Type 430) and other straight-chromium grades of Stainless Steel. This help is yours for the asking.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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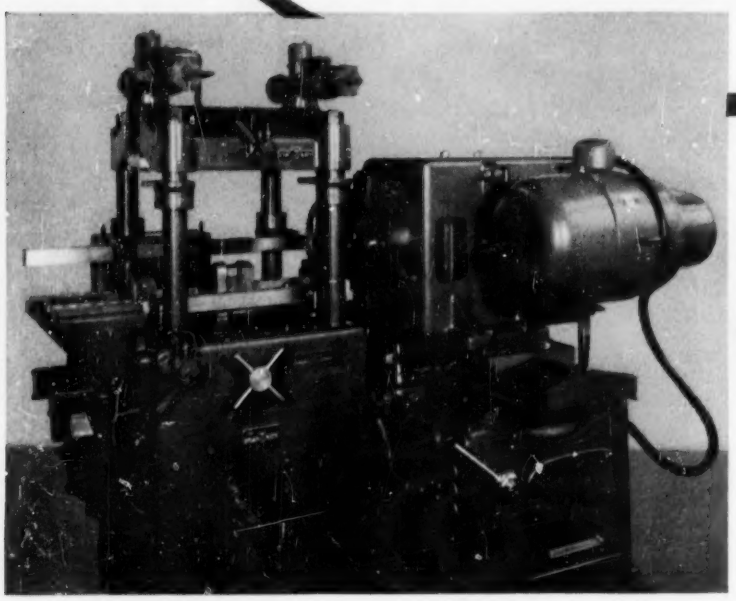
U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

3-1618

UNITED STATES STEEL

Hydromatic Bed and Dial Type Head Combine Forces to Mill Cylinder Blocks



Familiar units comprise this CINCINNATI special purpose miller. In this view, a cylinder block is clamped in position for the milling operation.

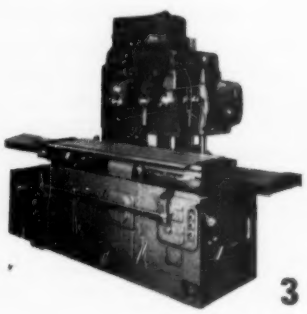
Operator's working station, showing comparative simplicity of Hydromatic and Dial Type combination.

PRODUCTION DATA

Part Name	Cylinder block
Material	Cast iron
Operation	Mill flywheel end square with crankshaft bearing
Cutting Speed	300 feet per minute
Feed	25" per minute
Production	30 per hour

1

2



3

THE CINCINNATI HYDROMATIC LINE:

Plain and Duplex styles, conventional and tracer controlled types, 18 sizes of each, 24" to 90" table traverse, 10 hp to 50 hp drive, standard and complementary unit construction for flexibility in building single-purpose machines.

1—Plain Hydromatic. Catalog No. M-1670-2
2—Duplex Hydromatic. Catalog No. M-1670-2
3—Plain Tracer Controlled Hydromatic. Catalog No. M-1602-1
4—Duplex Tracer Controlled Hydromatic. Catalog No. M-1602-1

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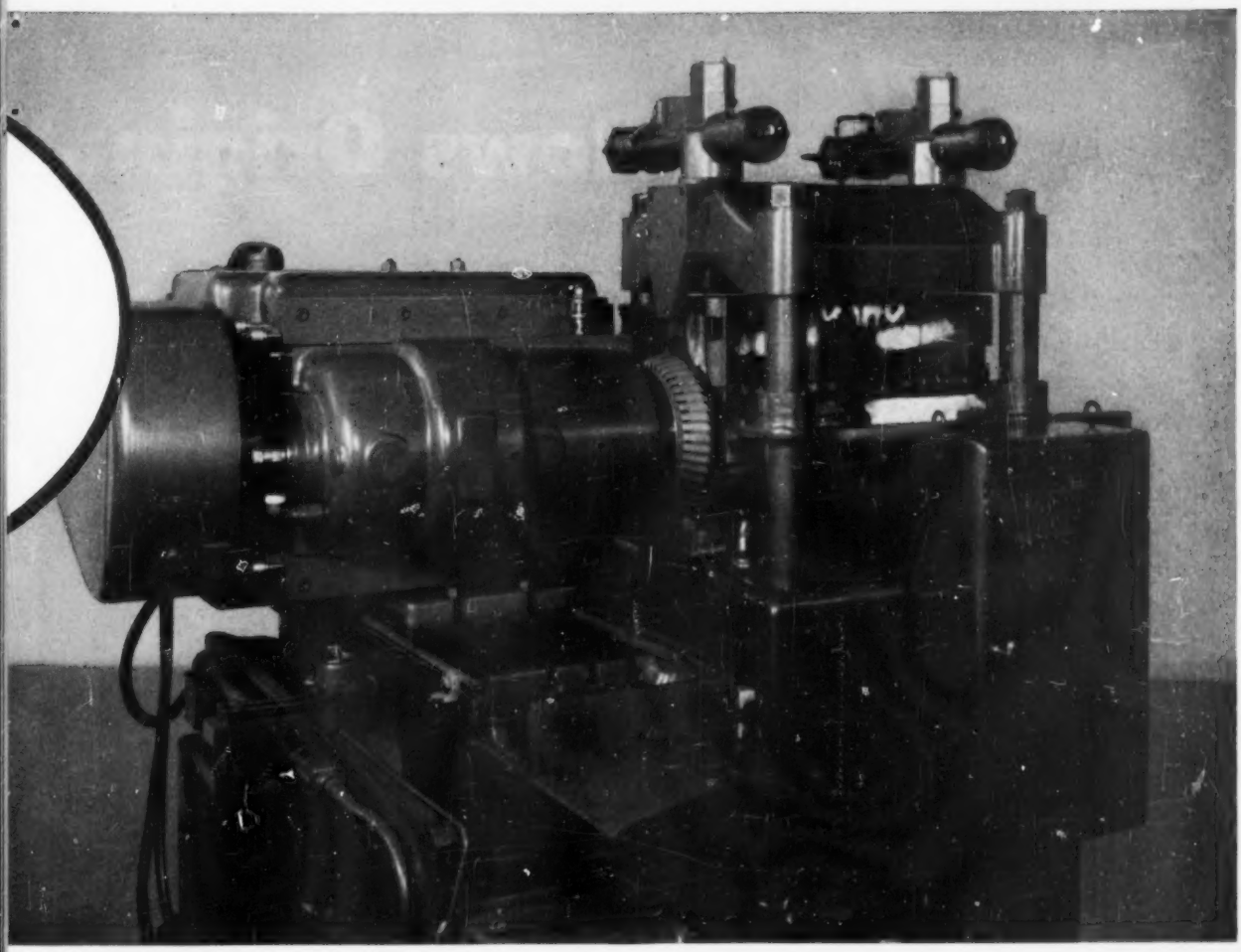
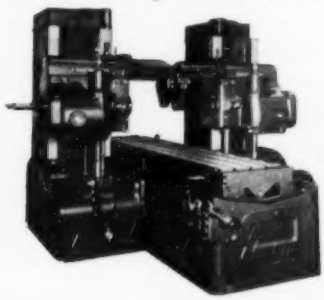


Unorthodox procedures sometimes work out to advantage. In this example, the work and cutter spindle head have been interchanged for an accurate milling operation on cylinder blocks. A lower unit cost resulted, and here are the reasons why. ¶ The machine, basically a CINCINNATI No. 3-24 Hydromatic Miller, is equipped with a spindle carrier mounted on the table, and a "dummy" headstock which incorporates a conveyor height fixture. The spindle carrier may look familiar to you . . . with minor alterations, it's the standard vertical head of a CINCINNATI No. 3 Vertical High Power Dial Type. To reduce physical effort for the operator, the fixture is pneumatically operated. A 12" diameter sintered carbide cutter takes the cut at 25" per minute. ¶ As you might suspect, this adaptation is the work of Cincinnati Application Engineers. These men are expert at taking standard units of CINCINNATI Milling Machines and putting them together with a minimum of special work to build up single purpose equipment to meet your requirements. Whether it's a tailor-made machine or merely a special unit, you can be sure of justifying your replacement policy with CINCINNATI handling your milling problems. May we hear from you?



CINCINNATI

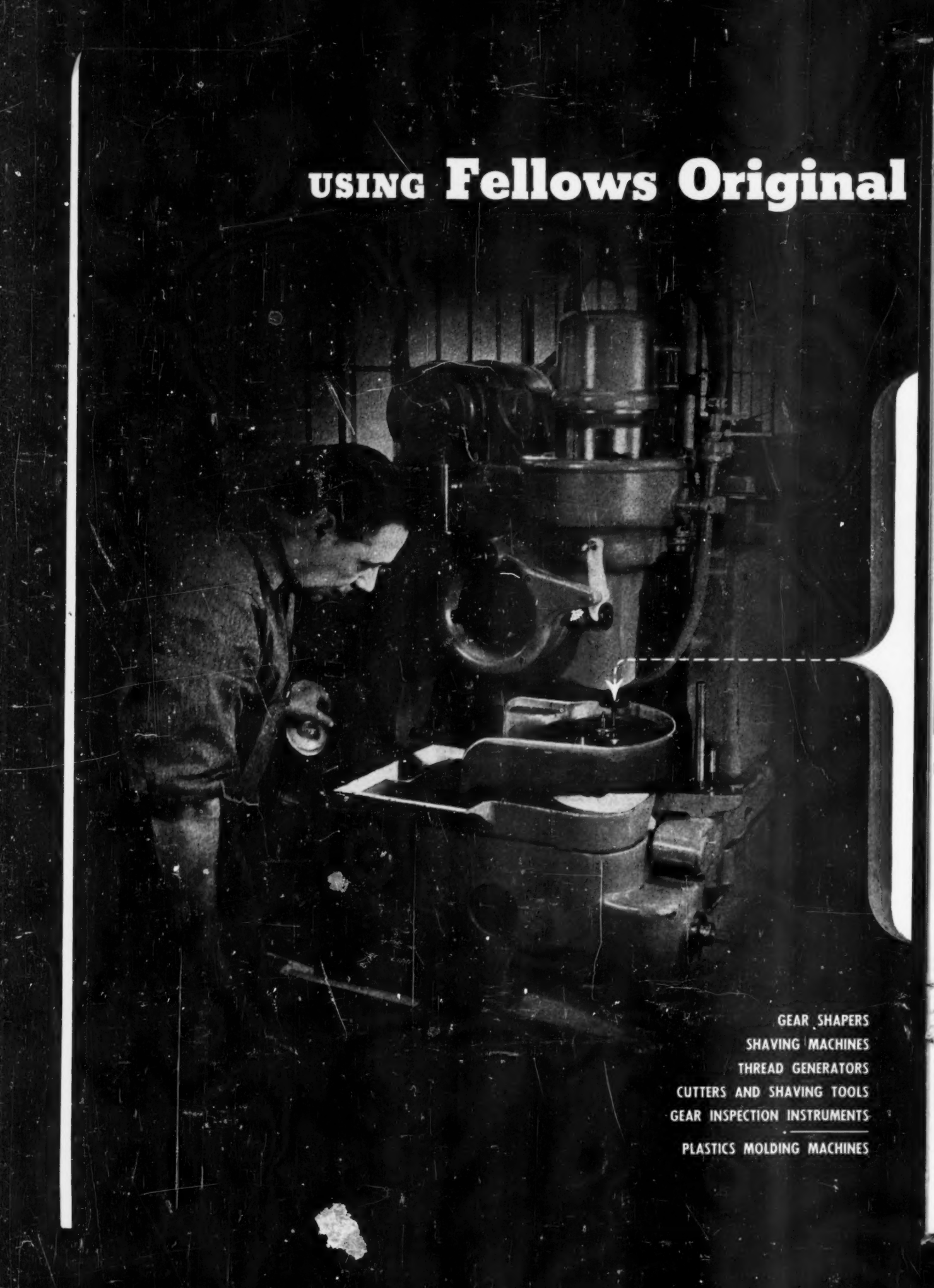
4

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

NATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

USING Fellows Original



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

Cutters . . .

CONTROL INSTRUMENT COMPANY KEEPS REJECTS "well under 1%"

PRODUCTION DATA

Number of Teeth (Cutter) (Limited by projecting hub)	18
Number of Teeth (Gear)	96
Pitch	48
Pressure Angle	20°
Pitch Diameter	2.000 (+.002; −.000)
Run Out (Total Indicator Reading)	.001
Number of Cuts	2
Production Time (2 Cuts)	90 minutes
Blank Material	4140 Chrome Moly Steel

Control Instrument Company of Brooklyn, New York, uses a Fellows 7-Type Gear Shaper to cut this 2.000" pitch diameter internal gear for a military fire-control device.

Using original Fellows cutters for both rough and finish cuts of this 4140 Chrome Moly steel, the number of rejects is exceedingly small. Control Instrument Company says, "... using Fellows cutters, our rejects are well under 1%."

The versatile Fellows 7-Type is the most widely used size in Fellows' complete line of Gear Shapers which generate gears from 1/16" to 120" diameter. It offers precision and high production on external gears up to 7" diameter, 1½" face and on internal gears up to 5½" diameter, 1" face. Set-up is simple, and changeover on production runs is quick.

For helpful information on cutting coarse or fine pitch gears, cams, ratchet teeth, interrupted profiles, segment gears, face gears, racks, and other unusual, high quality gears—just write, wire or 'phone the Fellows office nearest you.

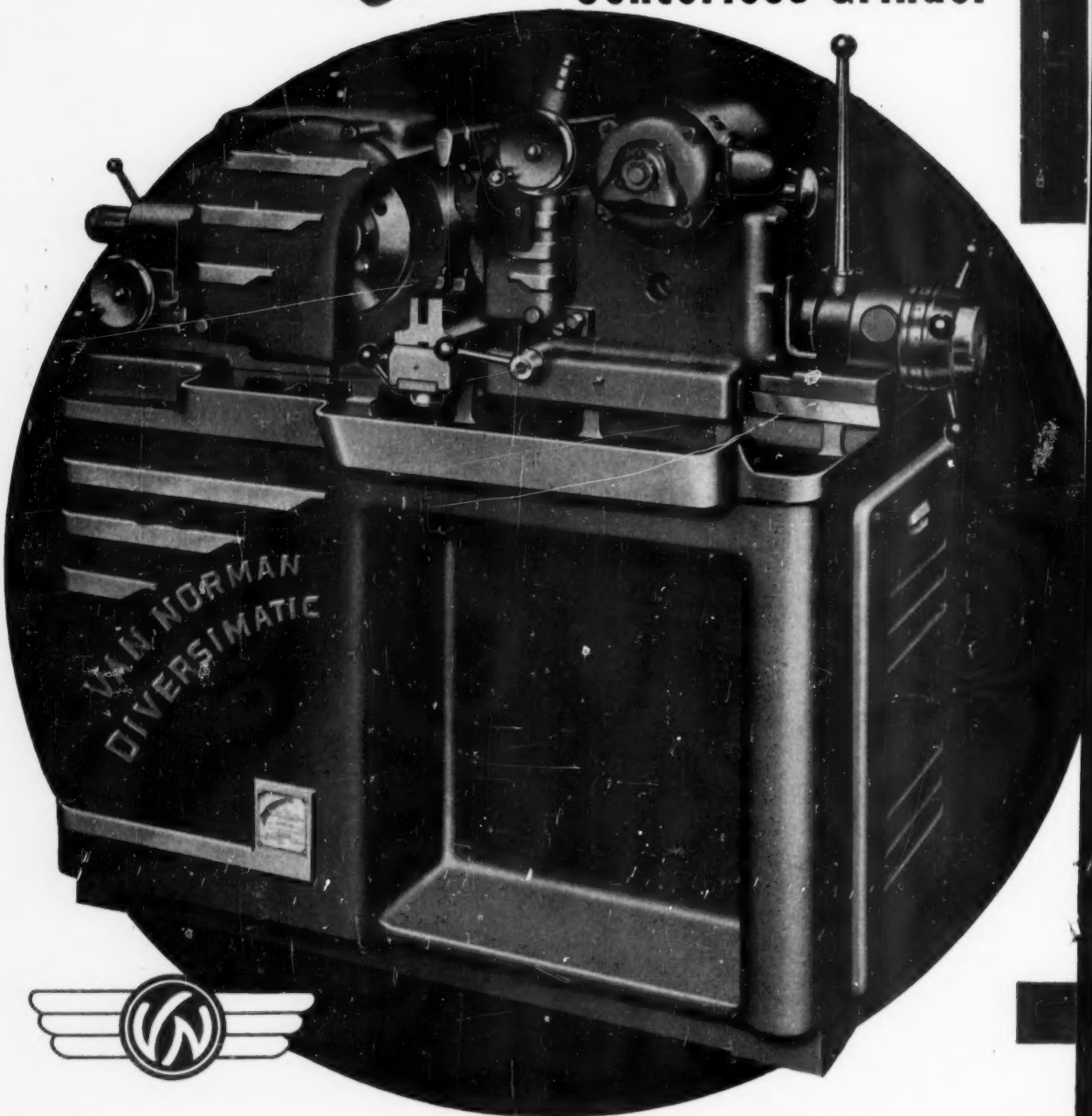
Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 323 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1

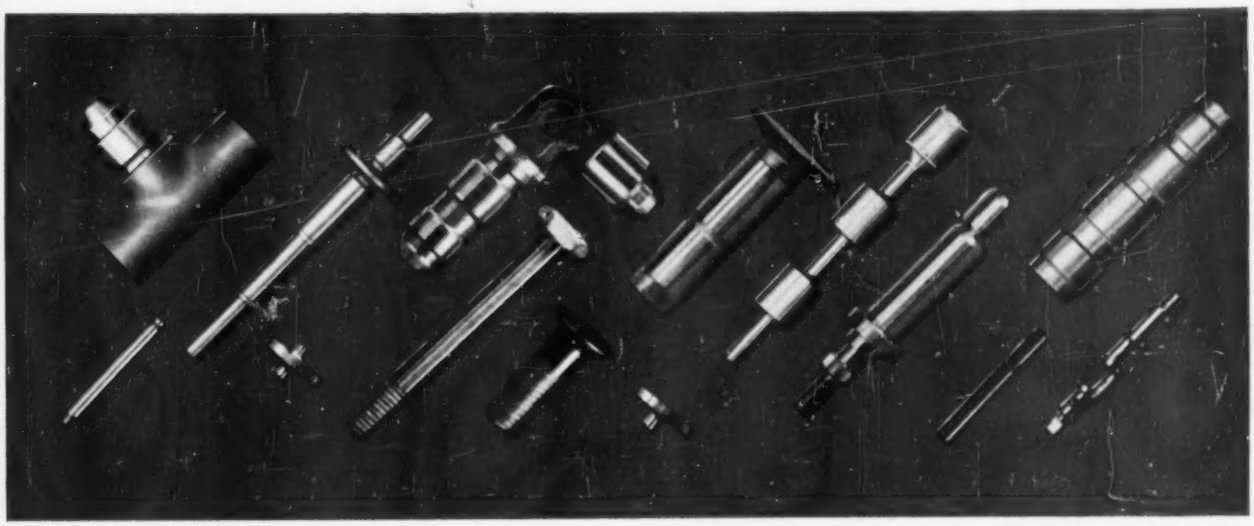
You can CENTERLESS GRIND parts

VAN NORMAN *Diversimatic*

Centerless Grinder



like these ECONOMICALLY with the



Illustrated, above, are but a few typical parts that have been precision ground economically on the Van Norman *Diversimatic* Centerless Grinder.

This outstanding centerless grinder can help you cut your grinding costs. It provides fine finish to close tolerances at high production speeds. Actually three machines in one, the Diversimatic is a standard centerless grinder for throughfeed work . . . a standard grinder for infeed jobs . . . and equipped with the Crush Forming Attachment, it form grinds and does profile work.

The Diversimatic finish grinds small parts from solid . . . or finish grinds rough-turned parts. It grinds faster, holds tolerances, cuts costs.

Compare these Outstanding Van Norman Diversimatic Features

- Special, easily removable grinding wheel, spindle quill, with combined double-row super precision ball and roller bearings, sealed and lubricated for life assure trouble-free operation
- Spindle requires no warm-up period
- Combination straight and contour grinding wheel dresser
- Straight screw-type regulating wheel dresser
- Grinding wheel diamond constantly flushed from below with coolant during wheel dressing
- Infinitely variable ¼ h.p. regulating wheel drive, 30 to 300 r.p.m.
- Large 1⅞ inch 4 thd. Acme Infeed Screw with full length split type nut to compensate for wear
- Work-Rest adjustable for position; may be fixed across the ways or made to feed in and out with the regulating wheel

Get the full facts on the Van Norman Diversimatic Centerless Grinder. See for yourself how this versatile grinder can cut your grinding costs on small shafts, formed shapes, parts of two or more diameters or special contours.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS, U. S. A.

Manufacturers of Precision Grinders Since 1912

From— THE ORIG

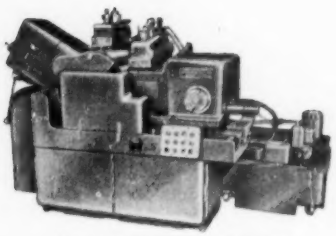
The Original Landis Die Head Built By A. B. Landis.

From one die head built in 1889 based on a revolutionary new principle in generating threads, to over 90 sizes and styles of threading machines—that is the Landis Story.

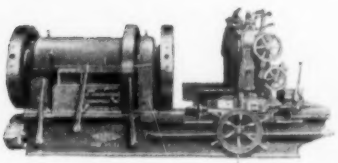
The constant research for better threading methods which has brought to Landis leadership in its field today plays an even more important part in our activities. On the record of the past stands our promise for the future.

We offer all manufacturers our years of experience in all phases of Threading. If you have a problem involving threads, whether design or production, or if you feel that your present threading methods should be improved, call on Landis.

Today—

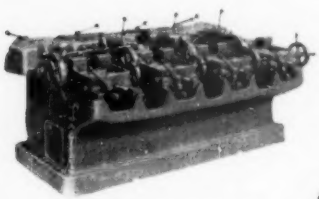


CENTERLESS THREAD GRINDER



PIPE THREADING & CUTTING OFF MACHINE

LANHYDRO DOUBLE-END MACHINE



LANDMACO QUADRUPLE HEAD THREADING MACHINE

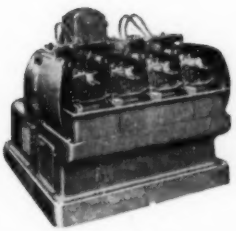
50th ANNIVERSARY

The LANDIS Machine

• • • THE WORLD'S LARGEST EXCLUSIVE

INAL LANDIS DIE HEAD....

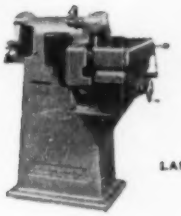
LANDIS THREADING MACHINES OF EVERY TYPE - - -

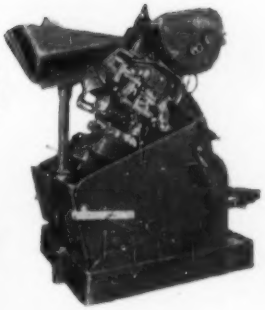


4-SPINDLE
SEMI-AUTOMATIC THREADER

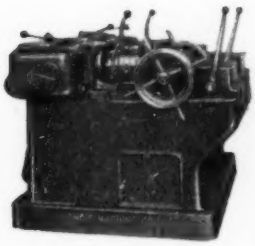
LITTLE LANDIS
THREADING MACHINE

AUTOMATIC FORMING
& THREADING
MACHINE

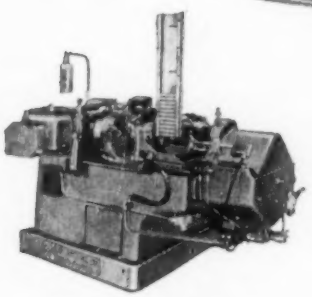




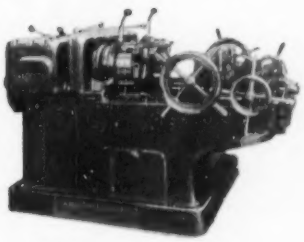
LANDIS CHASER GRINDER



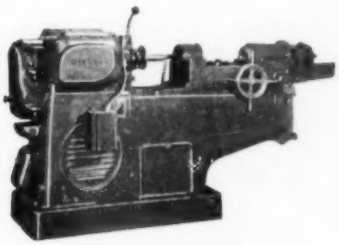
DOUBLE LANDMACO
PIPE & NIPPLE MACHINE



AUTOMATIC NIPPLE MACHINE

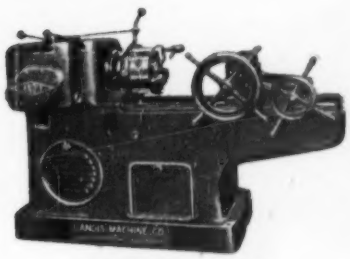


LANDMACO DOUBLE HEAD
THREADING MACHINE



LANDMACO SHELL TAPPER

3/8" THREADING MACHINE



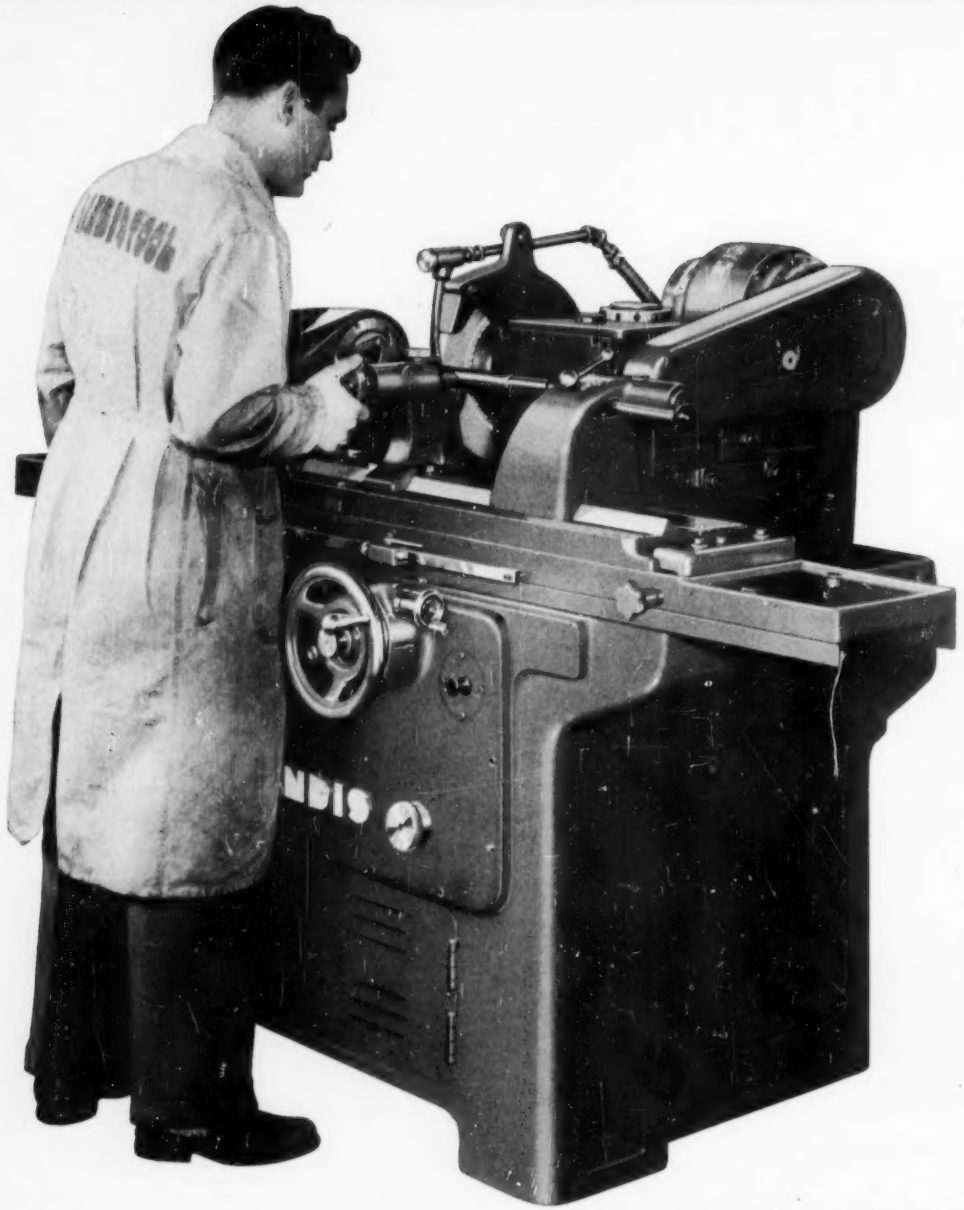
LANDMACO SINGLE HEAD
THREADING MACHINE

COMPANY LANDIS **WAYNESBORO PENNSYLVANIA**

MANUFACTURERS OF THREAD GENERATING EQUIPMENT

Save Time on Your Grinding Setups

One machine for all these jobs...



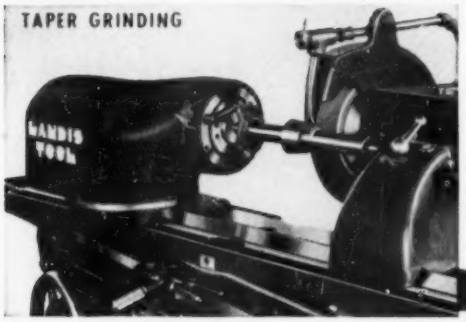
LANDIS

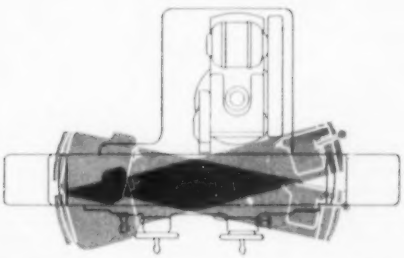
precision grinders

The Landis 12" x 28" Grindwell offers many operating features of larger Universal Grinders with savings in cost and floor space. Engineering Features: infinitely variable headstock speeds . . . live or dead spindle . . . two speed hand traverse and four speed power traverse . . . precision coarse and fine wheel feed . . . Microsphere wheel spindle bearings for high precision and fast spark-outs . . . swiveling headstock, wheelbase and work table.

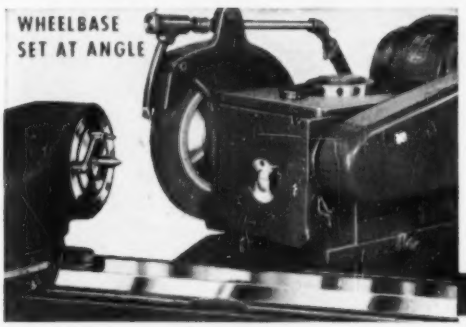
LANDIS Grindwell

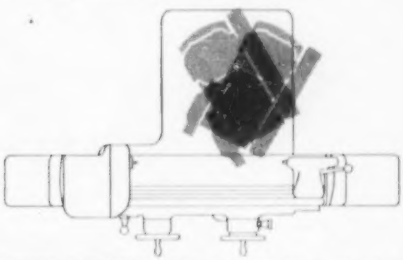
a low cost Universal Grinder designed for speedy setups and precision tolerances



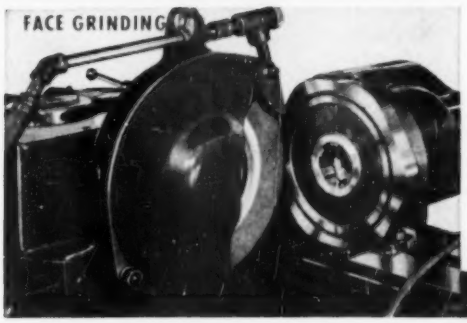


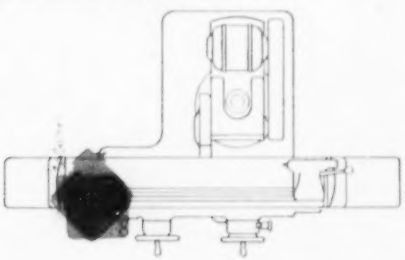
WORK TABLE SWIVEL—Calibrated scale at end of table for setting angle of taper grinding up to 24° included angle or 5" per foot. Center scale graduated for turning table 90° either direction.



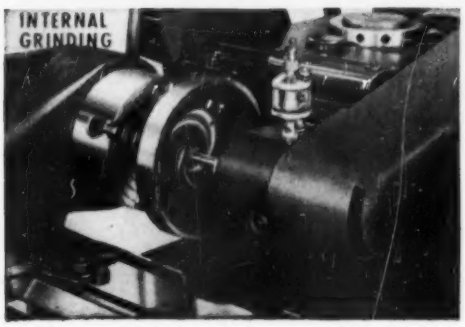


GRINDING WHEEL SWIVEL—Calibrated scale so wheel head can be set for angle up to 90° in either direction to eliminate work piece interference or dress angle on face of wheel.





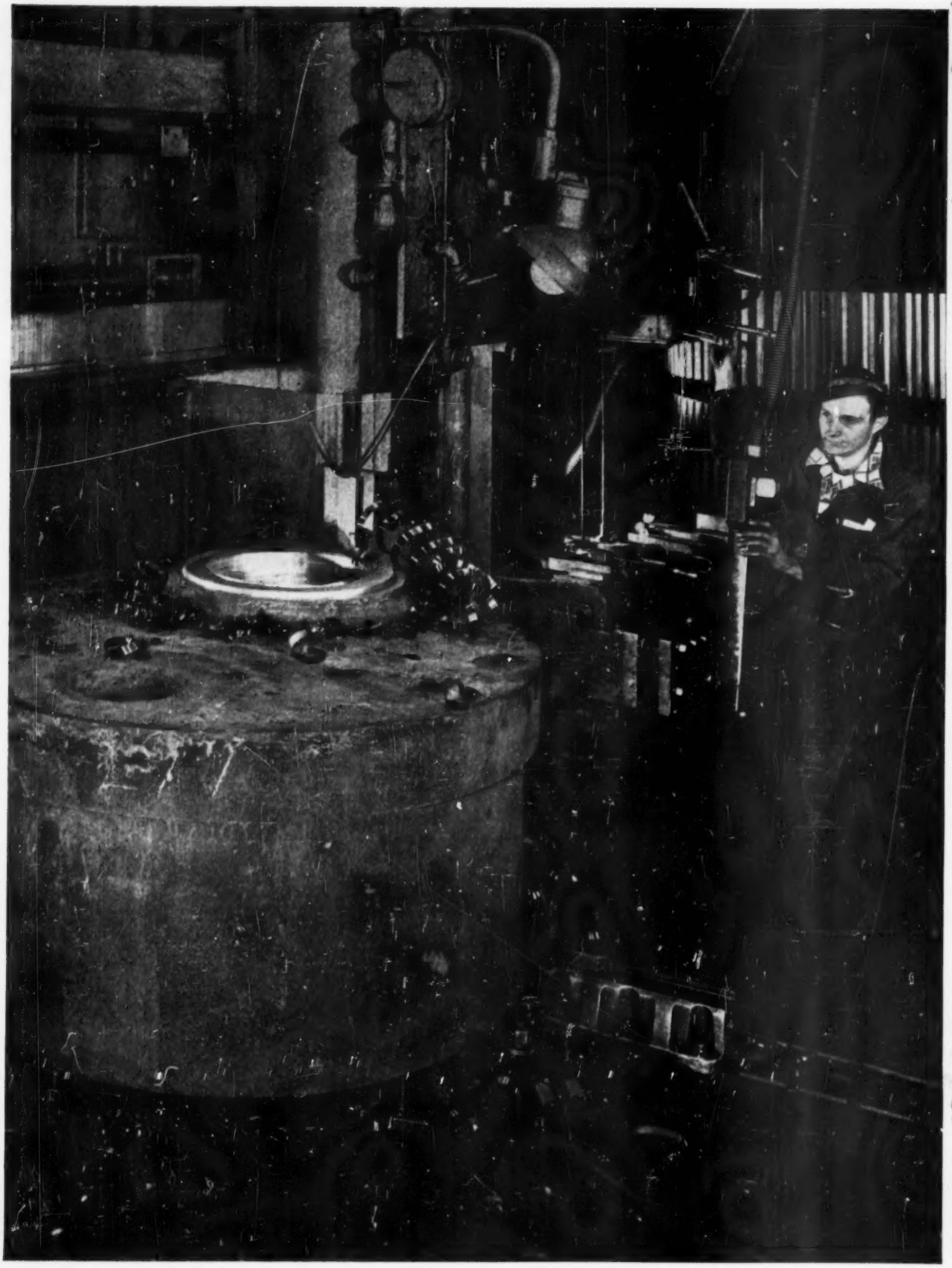
HEADSTOCK SWIVEL--Calibrated scale so angle up to 90° in either direction can be set for face grinding and tapered external or internal grinding of chucked work pieces.



For detailed features and specifications, write for Bulletin S-49.

LANDIS TOOL COMPANY

WAYNESBORO, PENNA., U. S. A.



Secret weapon...

yours or your competitor's?

Here's the G&L 8-ft. Heavy Vertical Boring Mill that gives you the advantages of speed, precision, extreme ease of control PLUS the capacity to economically perform a wide range of machining operations.

If your shop's efficiency and profit hinge on ability to perform many precision machining operations with one machine — check the G&L 8-ft. Heavy Vertical Boring Mill.

Its up-to-the-minute design incorporates all the latest features that speed up boring, turning, chamfering, facing, counterboring, grooving, recessing and numerous other operations. A new pendant control with a remote shift for single shift machines, increases operator efficiency and provides minimum expended effort on table speed changing. Feeds (16 in number from .004 to .750 in. per revolution) are conveniently available at all operating positions. Extra-heavy construction for best rigidity allows this size machine to be powered with drives up to and including 100 h.p. With a table diameter of 96 in. and heights under the rail available up to 101 in., large as well as small workpieces can be handled with the greatest degree of efficiency.

Two types of mechanical gear change drives and two types of single remote shift drives are available. Motors supplying power can be AC or DC for any recognized voltage or frequency. Tracer controlled machines are also available for special applications.

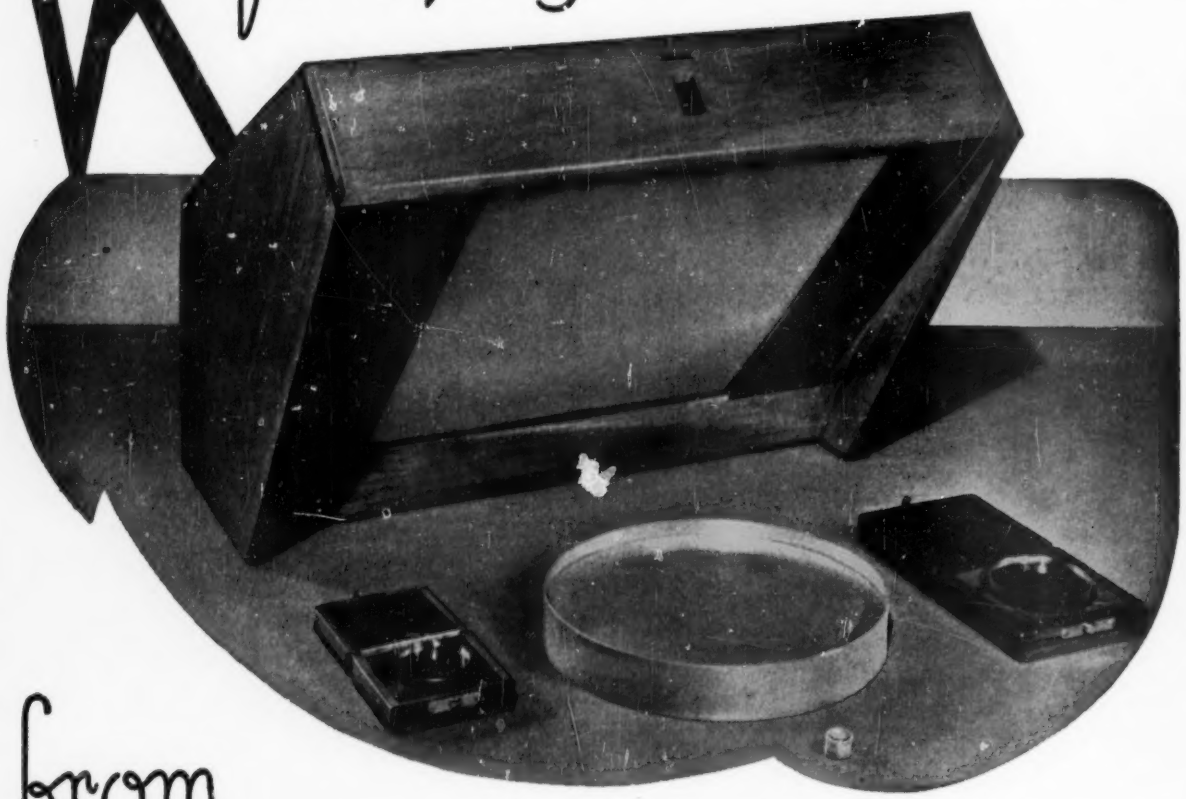
For complete information (on machines with 42-in. thru 12-ft. diameter tables), see your G&L representative or write —

GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

Photo courtesy of Cleaning Machine Corp.

VK fused quartz OPTICAL FLATS



from

½" diameter up . . . . accurate to .000001"

With VK Optical Flats, close checking of flat surfaces is simplified and more conveniently handled.

Shown here is the new Van Keuren monochromatic light, 22¼" wide, 17¼" high and 20" deep (in bench space). It is designed for use with large optical flats such as the one shown—a 10" diameter fused quartz double-surface master flat (accurate to .000001" both sides).

VK Optical Flats are available in sizes from ½" diameter to 10" diameter in .000001", .000002" or .000004" accuracy. They can be shipped within 30 days from order.

Catalog and Handbook No. 35 is available by writing: The Van Keuren Co., 173 Waltham St., Watertown, Mass. Ask for your copy.

VK

34th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

For low-cost chip collection, get FLEXMOUNT Oscillating Conveyors

Now available from stock

Metal-working plant collects aluminum chips with FLEXMOUNT Oscillating Conveyors. Collecting conveyors feed 116-ft. main conveyor carrying chips to disposal.

LOOKING for an efficient, easy-to-install method of handling chips, turnings, blasting shot, punching or stampings? You'll find the answer in the Link-Belt FLEXMOUNT Conveyor, now available from stock. Production-line manufacture of 8, 12 and 18 in. widths assures low costs on these stock sections. It's a simple matter to build up any length desired right in your own shop. For complete information, see your Link-Belt sales office or distributor, or write for Book 2478.

How Positive Action moves materials

Positive-action, constant-stroke eccentric drive provides a powerful, yet gentle upward and forward oscillating motion. Large volumes of material are moved in a uniform, continuous flow, regardless of surges. Resonant spring action of resilient legs cuts power requirements to an absolute minimum.

LINK-BELT

FLEXMOUNT OSCILLATING CONVEYORS

19,900

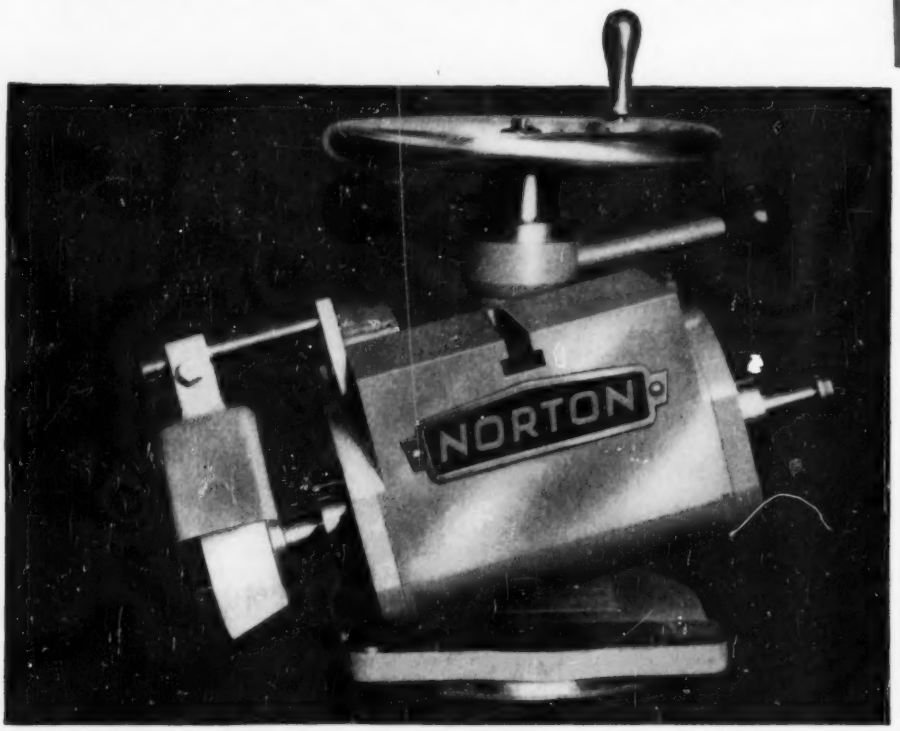
LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle; Scarboro, Toronto and Elmira, Ont. (Canada); Springs (South Africa); Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.

Only FLEXMOUNT gives you these 8 big advantages

1. POSITIVE ACTION. Uniform, continuous chip flow is assured regardless of load. Natural spring action reduces horsepower requirements to a minimum.
2. LEAK-PROOF. Trough is a single piece of metal. No coolant drip between machine and drain point. No return run.
3. COMPACT. A "natural" for restricted space. Opening need be only slightly larger than trough.
4. LONG LIFE. Minimum of moving parts. No joints or bearings in contact with material. The resilient legs that provide spring action last indefinitely.
5. LOW MAINTENANCE. Operates at low speed. Only drive need be lubricated.
6. SAFE. No moving parts in conveying trough.
7. JAM-PROOF. Reduces production stoppages. Handles bolts, nuts, bars, broken tools and even rags.
8. VERSATILE. Various widths, standard lengths up to 100 ft., with one drive. Dividers can be installed to convey simultaneously two or more materials, such as brass and steel chips, without mixing.

The wheel head tilts!

The #20 cutter and tool grinder gives you the "TOUCH OF GOLD"



No other cutter and tool grinder does so many jobs so fast... so easily!

Featuring greatly increased versatility, the Norton No. 20 cutter and tool grinder brings new speed and economy to the widest range of tool and cutter grinding jobs. It brings you the "Touch of Gold", adds value to every piece of work it grinds . . . brings you more speed, more product value, more profit.

The wheel head can be tilted up to 15° above or below horizontal, and swivelled through 360° — simplifying such ordinarily difficult jobs as grinding taper reamers, step counterbores, form tools and milling cutters.

Other "Touch of Gold" advantages that make this Norton cutter and tool grinder easier to set up and more profitable to operate include: greater lengths of table traverse and wheel slide travel . . . integral motor spindle . . . centrally located column elevating hand wheel . . . wheel slide graduated dials readable from any position . . . automatically lubricated table ways . . . electric equipment built to Machine Tool Builders' standards . . . wheel spindle reversing switch (optional) for carbide grinding.

Only one of the world's most complete line of grinding machines, the No. 20 is a typical development of Norton's engineering leadership. *Remember — only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost.* This leadership is at your service for your present or "post emergency" problems.

Why not investigate how the No. 20 can modernize and speed up tool and cutter grinding in your plant? See your Norton Representative for detailed information — and ask him about Norton cutter and tool grinders Nos. 1 and 2, and the BURA-WAY Grinder for automatic lathe tools. Meanwhile, write direct for Catalog 189, NORTON COMPANY, MACHINE DIVISION, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products to make other products better

District Sales Offices: Hartford . New York . Cleveland . Chicago . Detroit

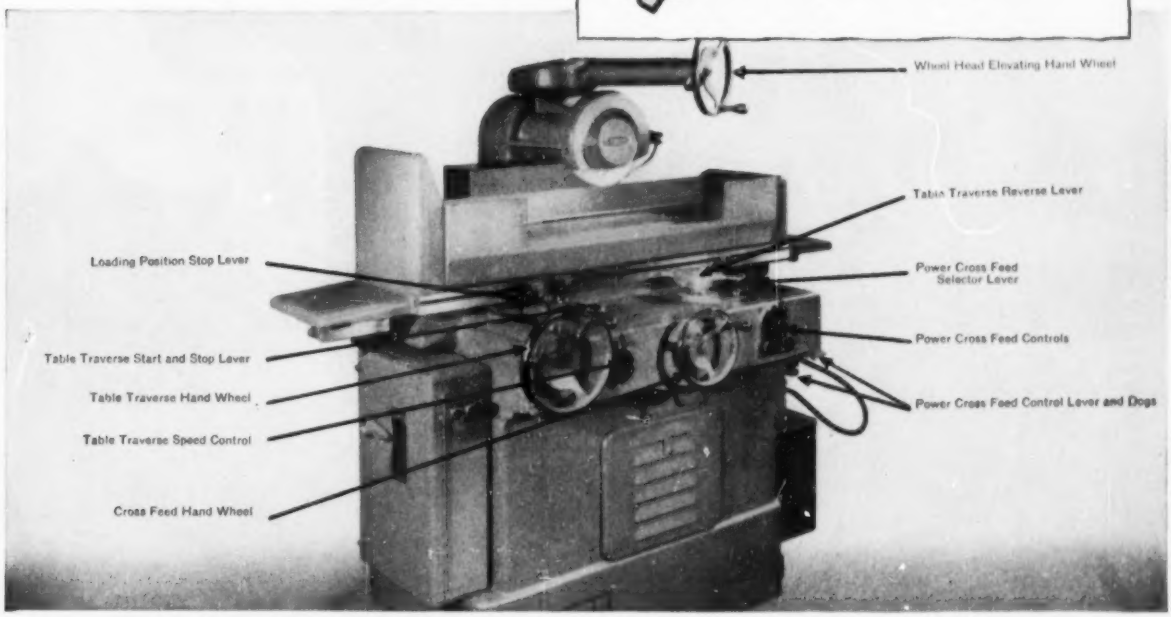
Easy to set up...
Easy to operate...

This 8" Norton Surface Grinder gives you the

"TOUCH OF GOLD"

on all kinds of jobs!

☑ *production or tool room*
☑ *military or civilian*


Wheel Head Elevating Hand Wheel
Table Traverse Reverse Lever
Loading Position Stop Lever
Power Cross Feed Selector Lever
Power Cross Feed Controls
Table Traverse Start and Stop Lever
Table Traverse Hand Wheel
Power Cross Feed Control Lever and Dogs
Table Traverse Speed Control
Cross Feed Hand Wheel

NOTE SIMPLICITY AND CONVENIENT GROUPING of controls on the Norton 8" x 24" surface grinder. Quick set up cuts your unit costs . . . makes "breaking in" of new production help far easier. It gives you the "Touch of Gold"

Here's a rugged machine with the real value-adding "Touch of Gold". It sets up quickly for a production run and maintains accuracy on quantity parts. But it's also efficient for grinding a variety of small units in tool room work. Its quick set up saves you time from job to job!

On a Norton Grinding Machine every touch of the wheel on the work is a "Touch of Gold" that gives you more value and profits. Investigate this great new grinder and its companion machines, the Norton 6" and 10" hydraulic surface grinders.

Remember — only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost. And Norton also offers you the world's most complete line of grinding machines.

We'll be glad to discuss your present problems or your plans for "post emergency" production, fitting tentative delivery schedules into your future plans.

Write for 12-Page Catalog 190 describing the Norton 8" x 24" surface grinder. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With **NEW**

NORTON

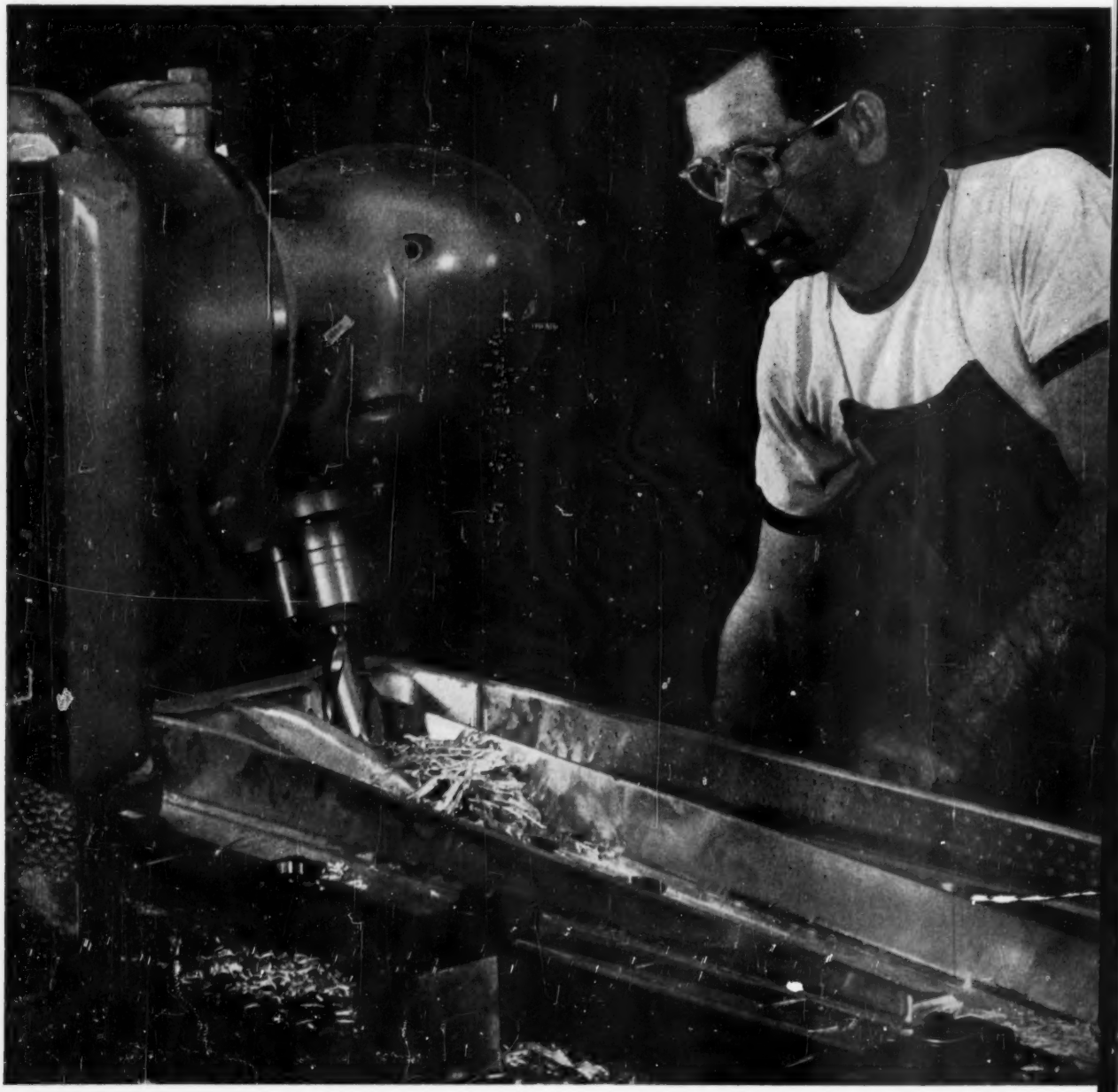
GRINDERS and LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit

KEARNEY & TRECKER MILWAUKEE

CK MILLING MACHINE OF STANDARD



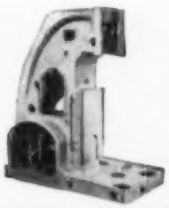
THE FACTS ON THIS JOB ARE: Machine: No. 6 — Model CK Plain (25hp) with heavy-duty universal Milling Attachment. Part: Large fusilage spar fitting — overall dimensions 39 5/16" x 17 3/8". Material: Aluminum Alloy 75ST (forging). Tool: 2-inch, 2-lip end-mill. (HSS). Speed: 265 rpm. Feed: 3 1/8 ipm.

Here's a typical example of how relatively inexpensive tooling greatly increases the versatility of Kearney & Trecker's new CK milling machines . . . producing a completed part every 6 minutes. Two operations were required for each part — (one) milling out the holes and recessing on the edges, then after changing the attachment setting and cutter — (two) finishing the inside (see photo).

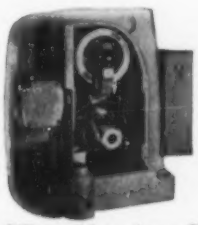
SPEEDS OUTPUT PRODUCTION PARTS

TEN ALUMINUM ALLOY 75ST (FORGING) AIRCRAFT SPARS PRODUCED EVERY HOUR FOR MAR VISTA ENGINEERING CO.

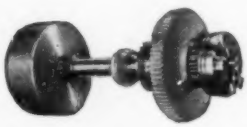
CK MILLING MACHINE FEATURES THAT HELP DO THIS JOB BETTER



Greater rigidity of new CK column easily absorbs vibration from heaviest cutting loads. Only single pass needed for each part.



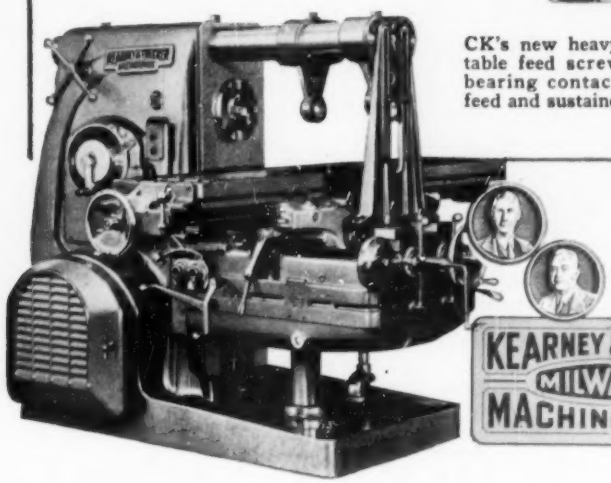
New CK machines have Greater Horsepower. On this job, 25 hp permitted operator to get maximum work from his modern cutter.

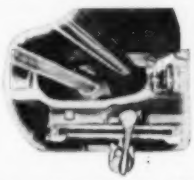


CK's 3-bearing spindle and flywheel assured Maximum Cutter Efficiency. On this job, it meant fast metal removal and excellent finish in a single pass.

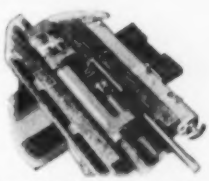
The new Kearney & Trecker CK milling machine on this job has 24 different spindle speeds (13 to 1300 rpm). Its 32 different table feeds range from 3/8" to 90" per minute. Operator was able to pick proper *speed and feed* — to take full advantage of high horsepower and modern tools. The result — Greater Productivity on this job.

New 25hp No. 6 Model CK Plain





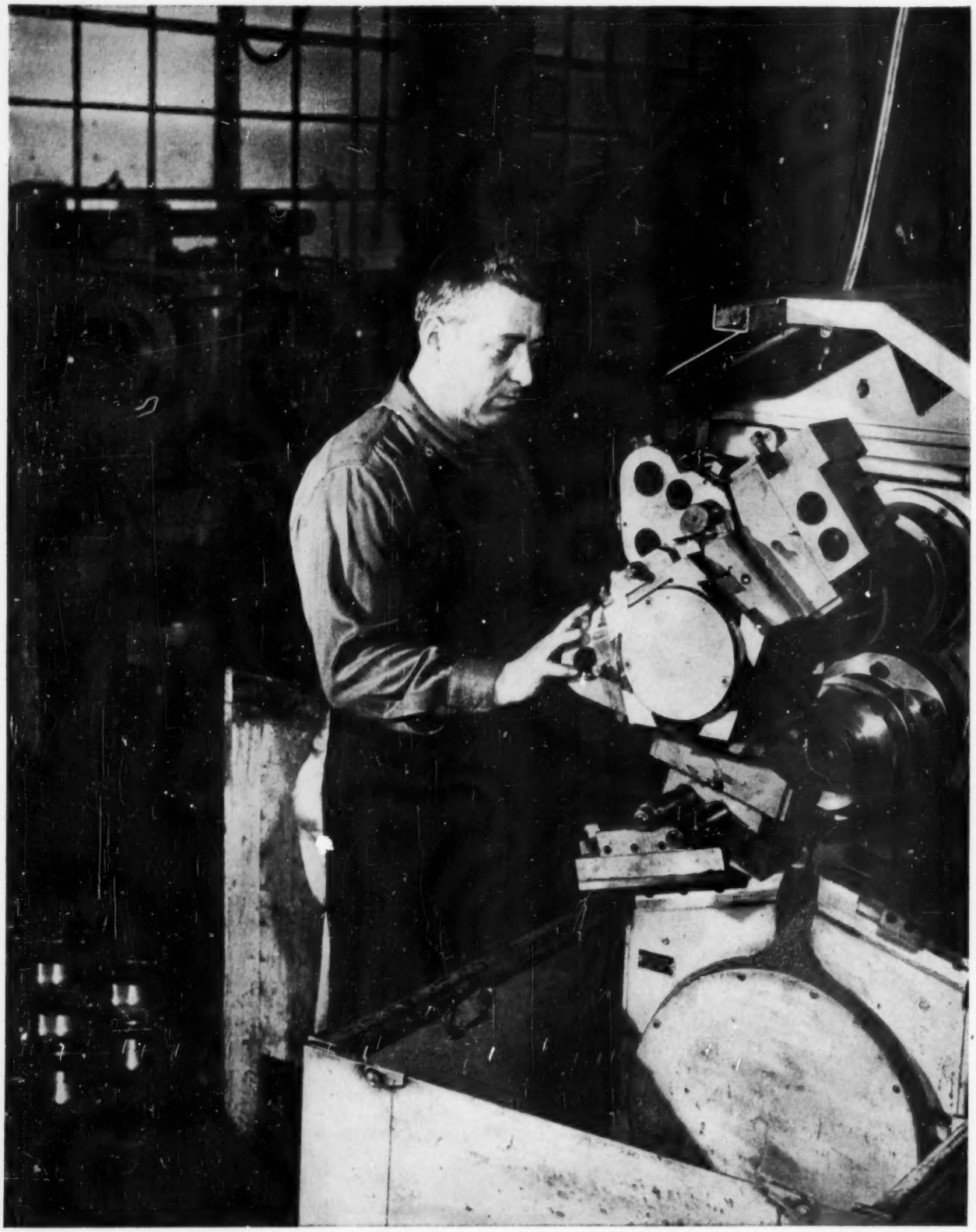
CK's new heavy duty (2" dia.) table feed screw gives greater bearing contact for smoother feed and sustained accuracy.



CK's positive lubrication plus generously proportioned gears and shafts assure cool, trouble-free operation under heaviest loads.

IT will pay you to see the new CK line of milling machines — check them against your own requirements. You'll notice how every feature is designed and job-proven to give you cost-cutting results — greater capacity, productivity and better finished products. For the full story, contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS



YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

When Precision was the Pay-Off!

HALEY MACHINE COMPANY, Springfield, Ohio, recently installed a Warner & Swasey 1 AC Single Spindle Automatic Chucking Machine to turn vital, high-precision hydraulic pump parts for U. S. Army tanks. The job called for extreme accuracy, because these pumps are filled under pressure with an antifreeze that has a tendency to leak where water will not.

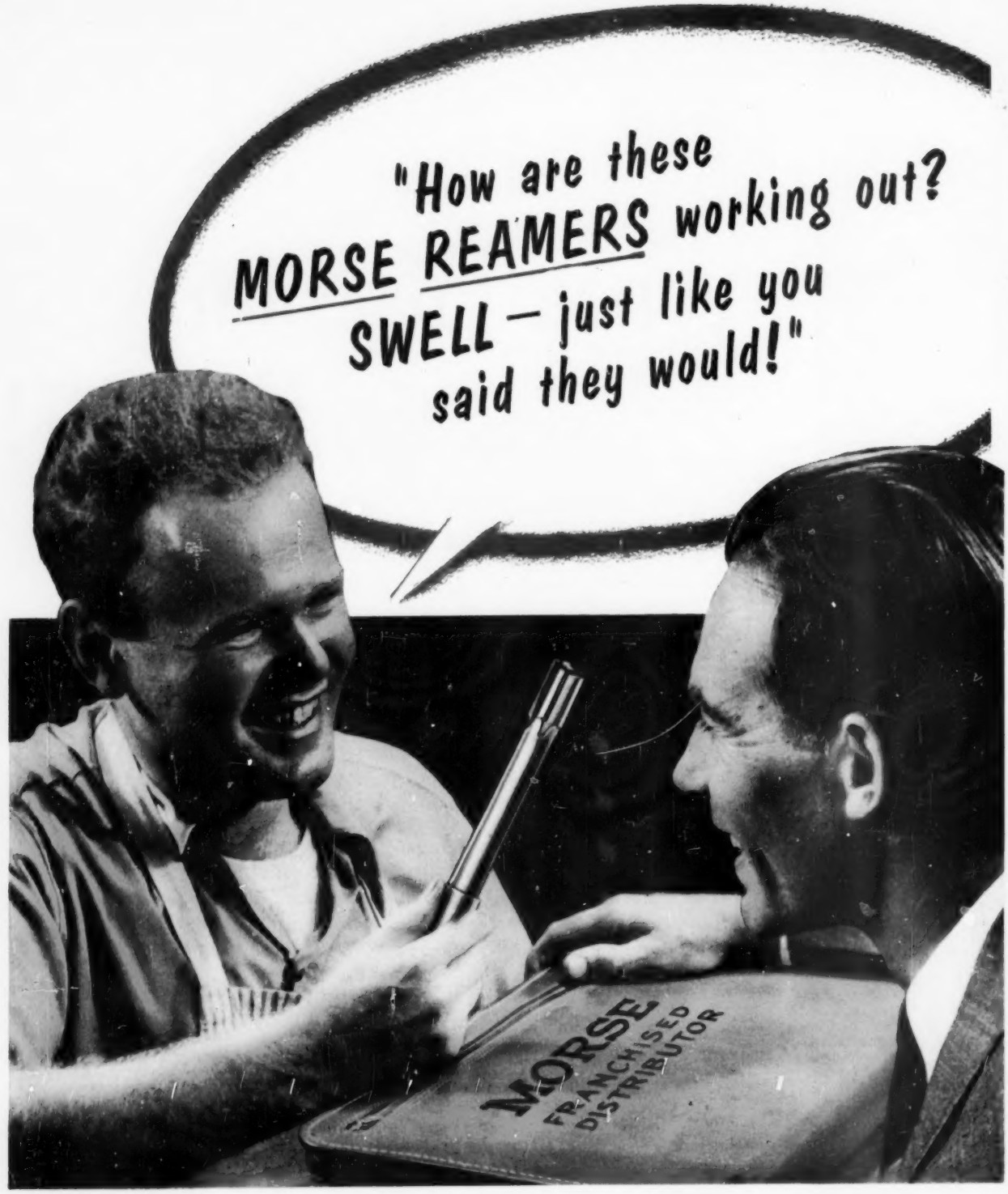
To avoid leakage these extremely close tolerances had to be held—40 to 63 micro-inch finish on surface finishes, .002″ on forming, .0008″ to .001″ on turning, and .001″ in concentricity. Maintaining such accuracy with previous methods was difficult—scrap loss was too high. Production had to be speeded up.

The Warner & Swasey Automatic took the function of holding these close tolerances out of the operator's hands—substituting the automatic operation of this high-precision machine for the job. Production was doubled—in some cases tripled! Scrap loss was reduced 12 to 15%!

This type of consistent accuracy is just not possible by manual methods due to the human error of even the best machinists. It is even unusual for an automatic. But the Warner & Swasey 1 AC has the rigidity, the *built-in* accuracy, plus the ability to repeat accurate settings to handle the *most difficult* jobs!

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY


"How are these
MORSE REAMERS working out?
SWELL — just like you
said they would!"
MORSE
FRANCHISED
DISTRIBUTOR

MORSE

See your Morse-Franchised Distributor about

MORSE REAMERS

for "Top-Hole" performance on every job

Staggered flute-spacing is the payoff feature of Morse Reamers. It ends biting, slipping . . . gives you smooth cutting and *accurate hole-sizing every time.* Chips are cleared freely, with no galling or scoring of the surface.

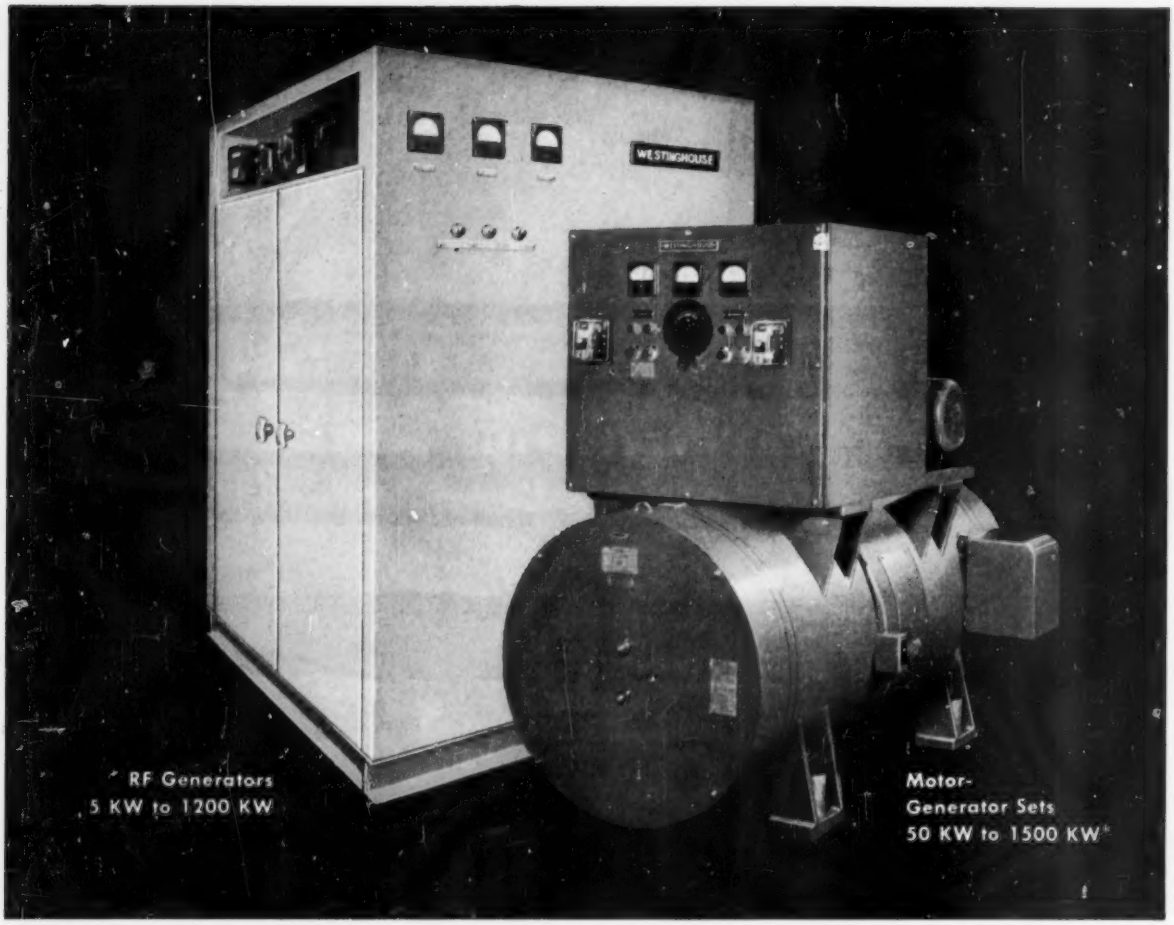
Morse makes *all* types of Reamers, for ferrous and non-ferrous . . . including the Morse Expanding Chucking Reamer which can be reground again and again . . . and even including the huge tools used in bridge and structural work. What's more, you can get Morse Reamers *Electrolized* for extra life, if you wish.

Talk it over with your Morse-Franchised Distributor . . . he's got the know-how and the stock to start you toward better work and greater savings than you ever expected from this type of cutting tool. *Call him today.* He'll give you your first saving (in time) right now.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time



FOR INDUCTION HEATING— SPECIFY WESTINGHOUSE

Leader for Years in Total KW in Use—Years of experience gained by Westinghouse from hundreds of induction heating installations throughout industry can be applied now to your own heat-treating needs. You are assured of reliability — proved by the fact that the total kilowatt-hours generated by installed Westinghouse induction heating equipment has exceeded, year in year out, that of any other manufacturer.

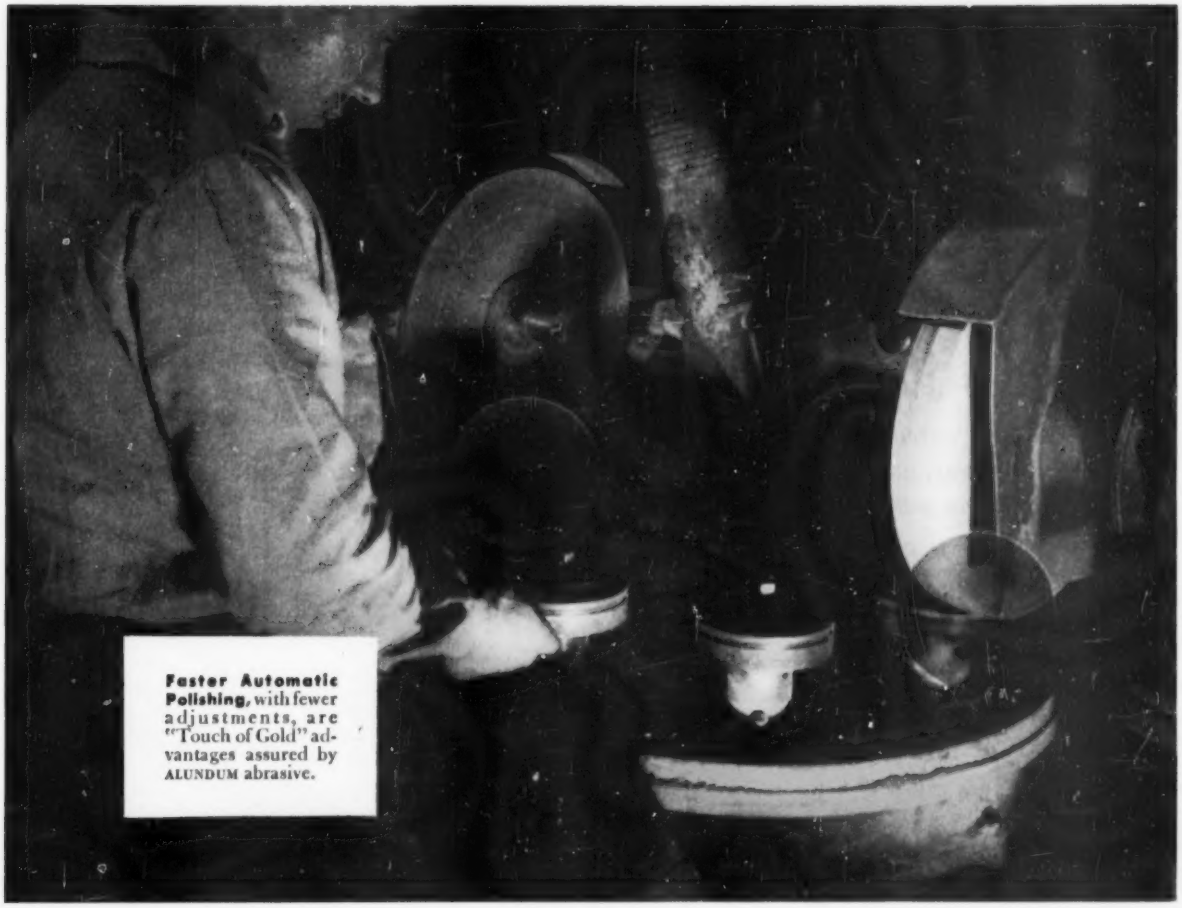
And you know that Westinghouse, as a manufacturer of both motor-generator and radio-frequency-generator induction heating units, is in a position to recommend equipment without bias for your specific requirements. Whatever your heat-treating problem, inquire about these efficient, versatile tools now. Call your Westinghouse representative or write: Westinghouse Electric Corporation, Electronics Division, Induction Heating Section, 2519 Wilkens Avenue, Baltimore 3, Maryland.

**Higher ratings can be supplied for any specific purpose.*

J-02271

YOU CAN BE SURE...IF IT'S

Westinghouse



Faster Automatic Polishing, with fewer adjustments, are "Touch of Gold" advantages assured by ALUNDUM abrasive.

Give your polishing the cost-cutting

"TOUCH of GOLD"

...with ALUNDUM* abrasive on your set-up wheels

Here are two big advantages that Norton ALUNDUM abrasive bring to your polishing:

Uniformity Careful processing control of Norton ALUNDUM abrasive assures that grains are uniform in size, structure and chemical composition. No oversize grains to mar surfaces — no flats, slivers or undersized grains that loaf on the job. Instead, you get a full quota of tough, sharp, equal-sized grains that stand up under severest conditions — each one doing its share of fast-cutting, uniform polishing.

High Capillary Action Norton ALUNDUM abrasive is specially treated to raise its capillarity, so that each grain soaks up glue easily and thoroughly. As a result, each grain is held as firmly as its neighbor — giving a strong, long-lasting, top-performing polishing wheel.

In Your Automatic Polishing advantages like the above are particularly important. With each ALUNDUM grain doing an equal share of the work, and each one tightly fixed to the wheel, you can be sure of top-quality polishing with minimum adjusting. That's the product-improving, time-saving "TOUCH OF GOLD" that will build *your* profits on *every* polishing job, from roughing to finishing!

See Your Norton Distributor for quick delivery of ALUNDUM polishing abrasive in the types, sizes, and surface treatments you need. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed in your telephone directory yellow pages under "Grinding Wheels." *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

G-261

NORTON

ABRASIVES

Making better products... to make other products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Look here

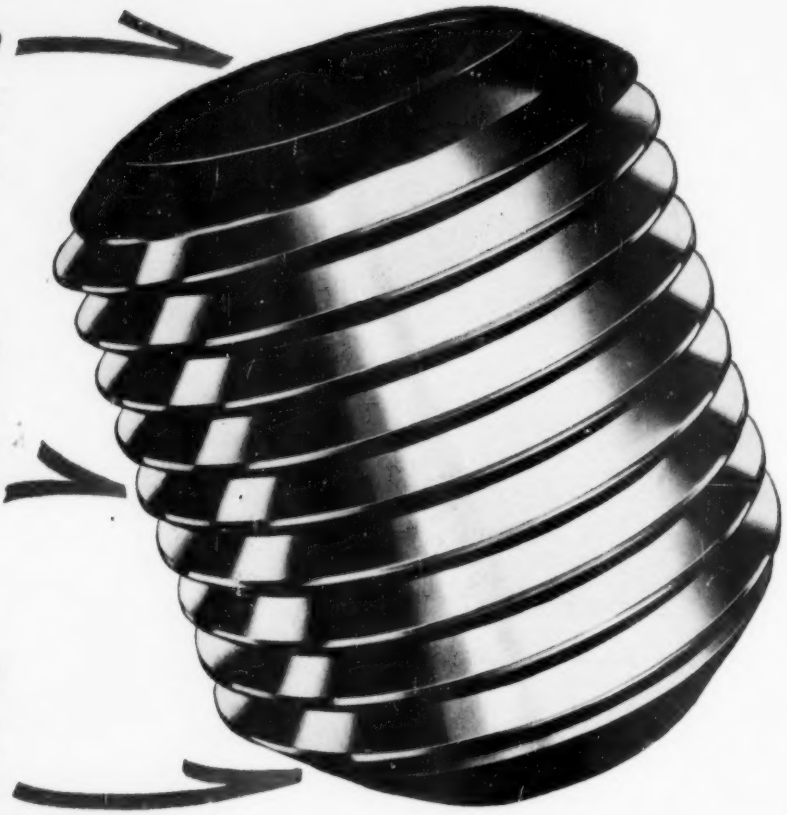
and see why the P-K Hex is the Standard for accuracy. It's true-centered, true to size, right depth for easy keying!*

Look here

for P-K *Ground Threads*, the smoothest, brightest, gage-like threads you've ever seen on a Socket Set Screw!*

Look here

for clean, burr-free starting threads, another advantage of P-K thread-grinding that means faster assembly!*



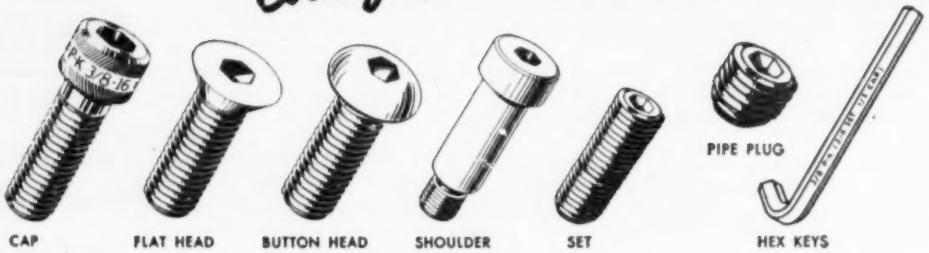
* You'll have to *look beyond* even the best picture to see the super-smooth, gleaming finish, the years-ahead quality of P-K Ground Thread Socket Set Screws. But you'll agree when you see the actual screws.

So get SAMPLES . . . and compare. Ask your P-K Distributor, or write Parker-Kalon Corporation, 200 Varick St., New York 14.

The INDUSTRIAL DISTRIBUTOR steers your Supply Dollars to the best values.

PARKER-KALON®

Cold-forged **SOCKET SCREWS**



Gardner Abrasive Engineering

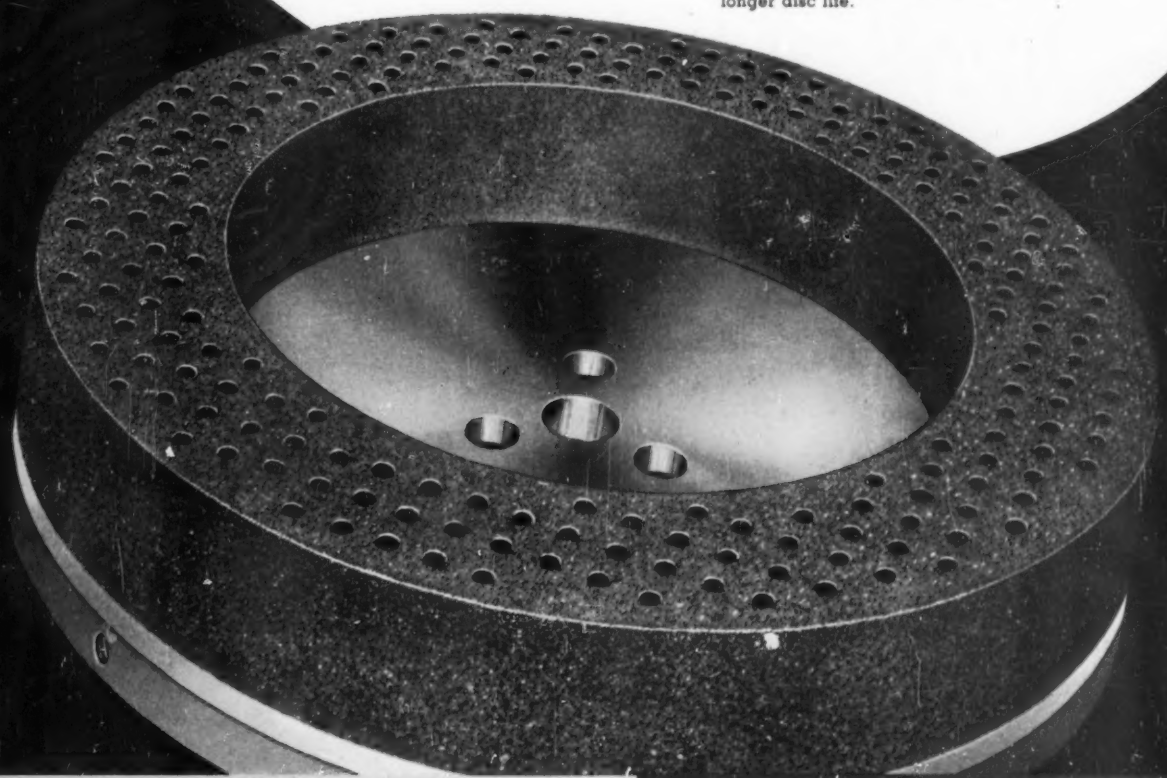
How an abrasive disc was tailored to a special work carrying fixture

THE PROBLEM

A double disc grinder with a rotary work carrying fixture was producing periodic inaccuracies in work. The abrasive disc continually built up a ridge around the center hole. Frequent dressing was necessary to hold tolerance. Production was low, abrasive life short.

THE SOLUTION

Gardner Engineers located trouble in location of rotary work carrying fixture. Work pieces were not reaching center hole of disc, thus causing a ridge to form around center area. Problem was solved by furnishing discs with larger centers, permitting a portion of each work piece to pass into the center. Immediate results were fewer rejects, more production, longer disc life.



Gardner Abrasive Engineering offers experience derived from making both the grinding machines and the abrasive discs. It considers machine performance first and then evaluates how grade and grain of abrasive or type of disc affect grinding results. If standard abrasive discs won't do the job, discs are made *just for you.*

For help with *your* grinding problem, consult the Gardner Abrasive Engineer. 114A

GARDNER MACHINE COMPANY
410 Gardner St., Beloit, Wisconsin, U. S. A.

GARDNER

abrasive discs

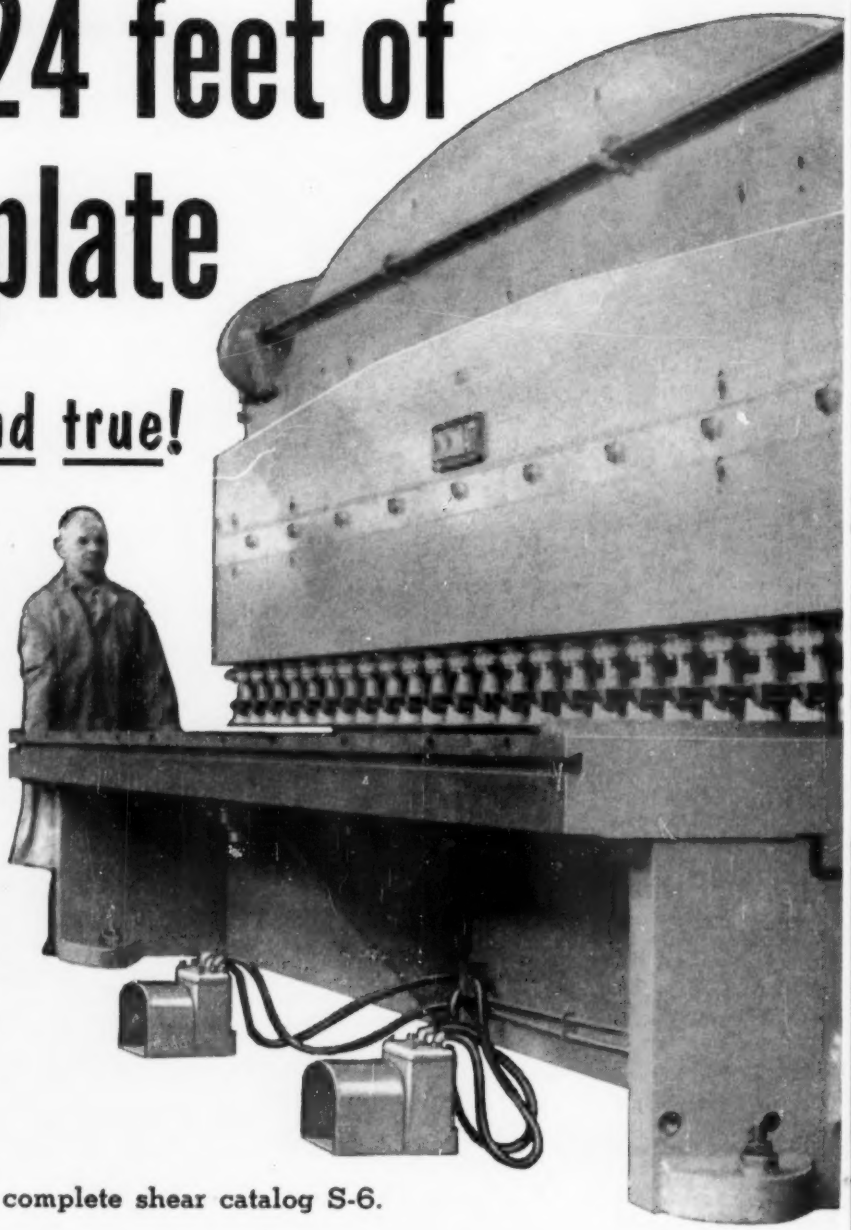
"CINCINNATI"

shears 24 feet of ¼ inch plate

...straight and true!

Cincinnati Shears, built with machine tool accuracy and exceptional rigidity, cut to close tolerances even on the longest cuts.

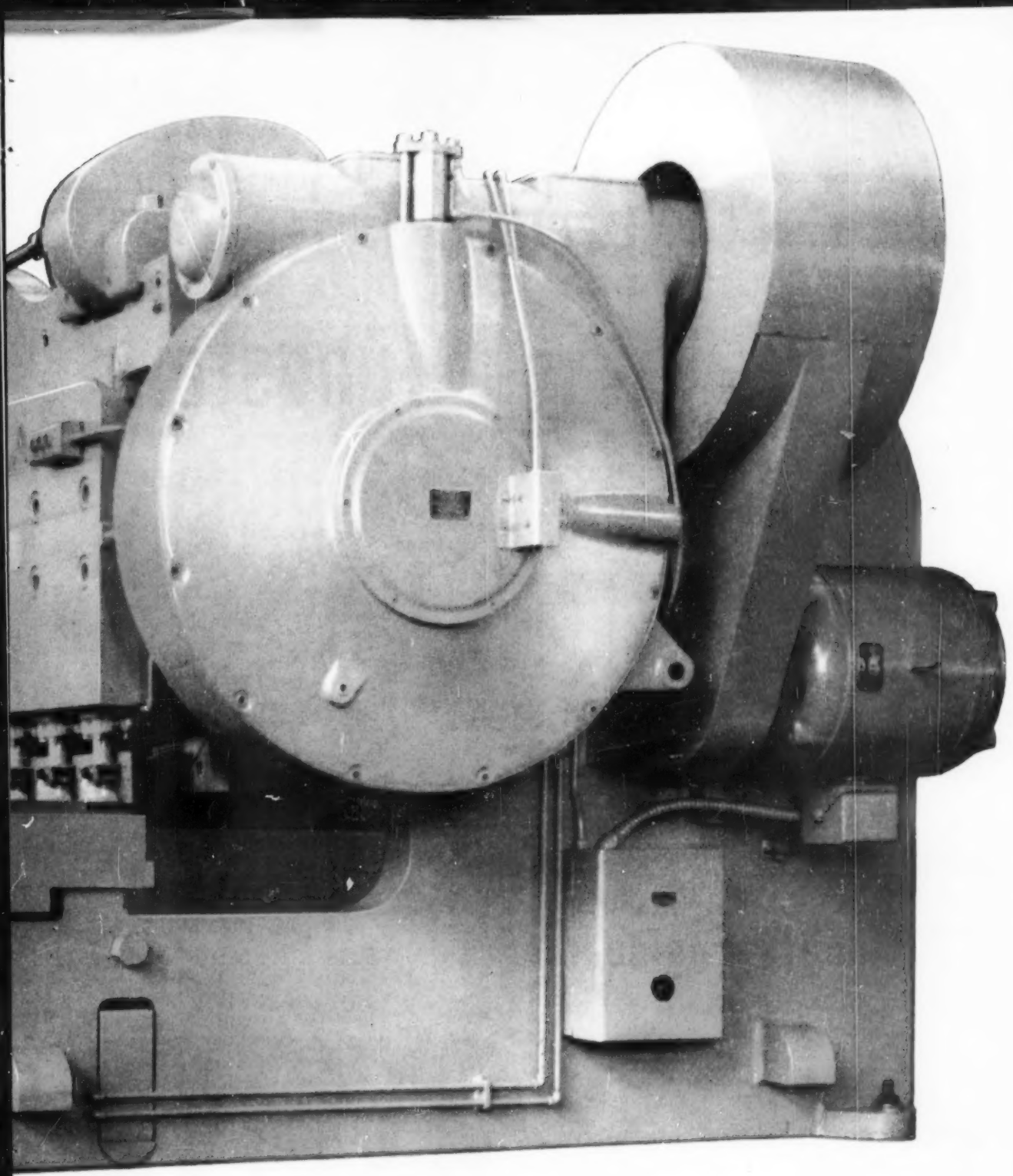
Built in lengths from 4 ft. to 24 ft., they shear .005" thick sheets to 1¼ in. plate with micrometer accuracy. They handle a wide variety of materials ranging from soft aluminum to armor plate.



Write for complete shear catalog S-6.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES



■ **Cincinnati 10024 Series Shear capacity ¼ in. mild steel 24 ft. long.**

Specialists in Tungsten Carbide Tools

They're Precision Machine Ground-From-The-Solid

Quality Engineered } BURS, REAMERS, END MILLS BORING BITS & OTHERS

Representatives and Distributors in principal cities in the United States and Canada. Write us for the name and address of our Representative in your area.

Send for complete catalog NOW!

THE ATRAX COMPANY
NEWINGTON 11, CONNECTICUT

GLEASON announces . . .

5

new machines

No. 104 Straight Bevel CONIFLEX® Generator

No. 106 Hypoid Generator

No. 104 Angular Hypoid Tester

No. 104 Spur Tester

No. 104 CONIFLEX Cutter Sharpener

GLEASON

GLEASON WORKS · ROCHESTER 3, N.Y.

No. 104 Straight Bevel CONIFLEX Generator

for cutting straight bevel gears from 16 DP to 3 DP, 8½" diameter, 1⅜" face.

APPLICATION:

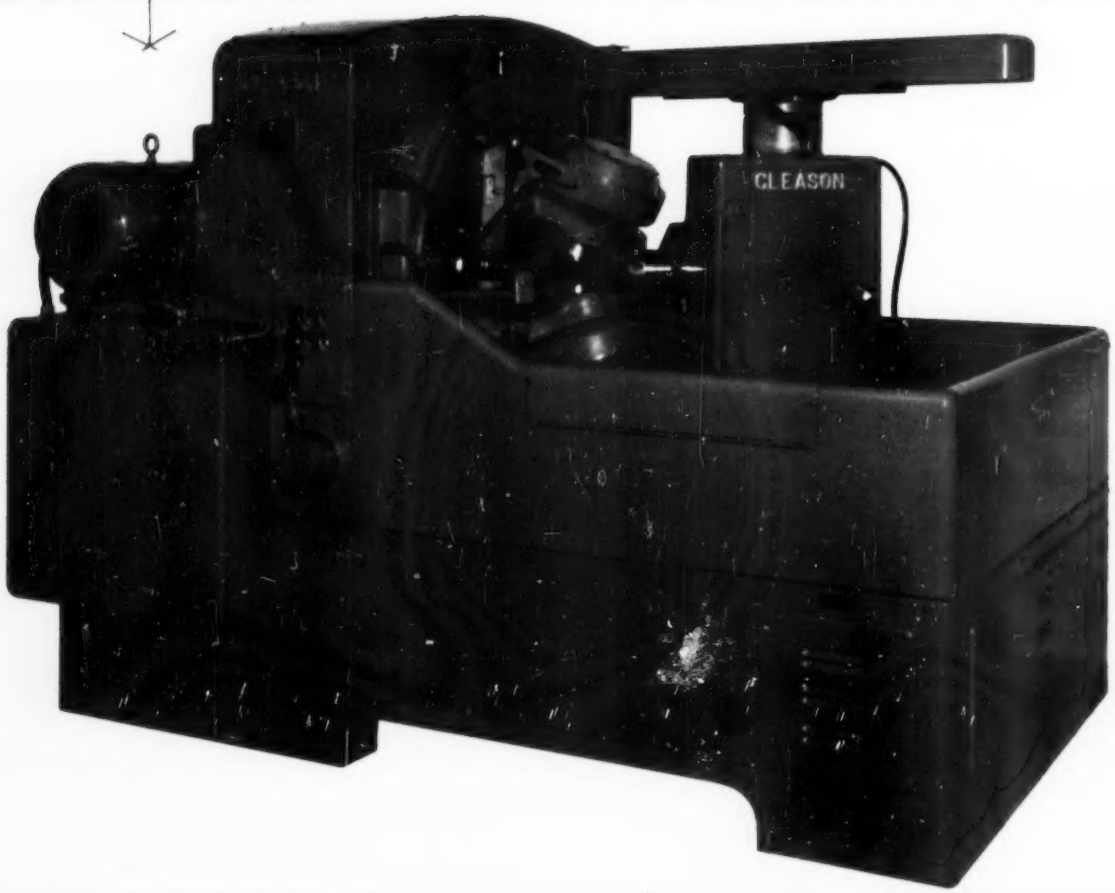
Completing of generated gears and pinions for volume production or small quantities.

ADVANTAGES:

Increased productivity—all gears completed from the solid blank in one operation . . . Highest quality – CONIFLEX tooth form fully interchangeable with that produced on Gleason two-tool generators.

FEATURES:

Cutting is done by two interlocking disc-type 9" diameter cutters . . . Small number of cutters covers entire machine range . . . Set-up and tooth development are simple . . . New generating method results in maximum cutter life, excellent finish, and high efficiency of the completing cycle.



GLEASON WORKS ROCHESTER 3, N.Y.

No. 106 Hypoid Generator

for cutting ZEROL® bevel, spiral bevel, and hypoid gears up to 4 DP, 8½" diameter, 1¼" face.

APPLICATION:

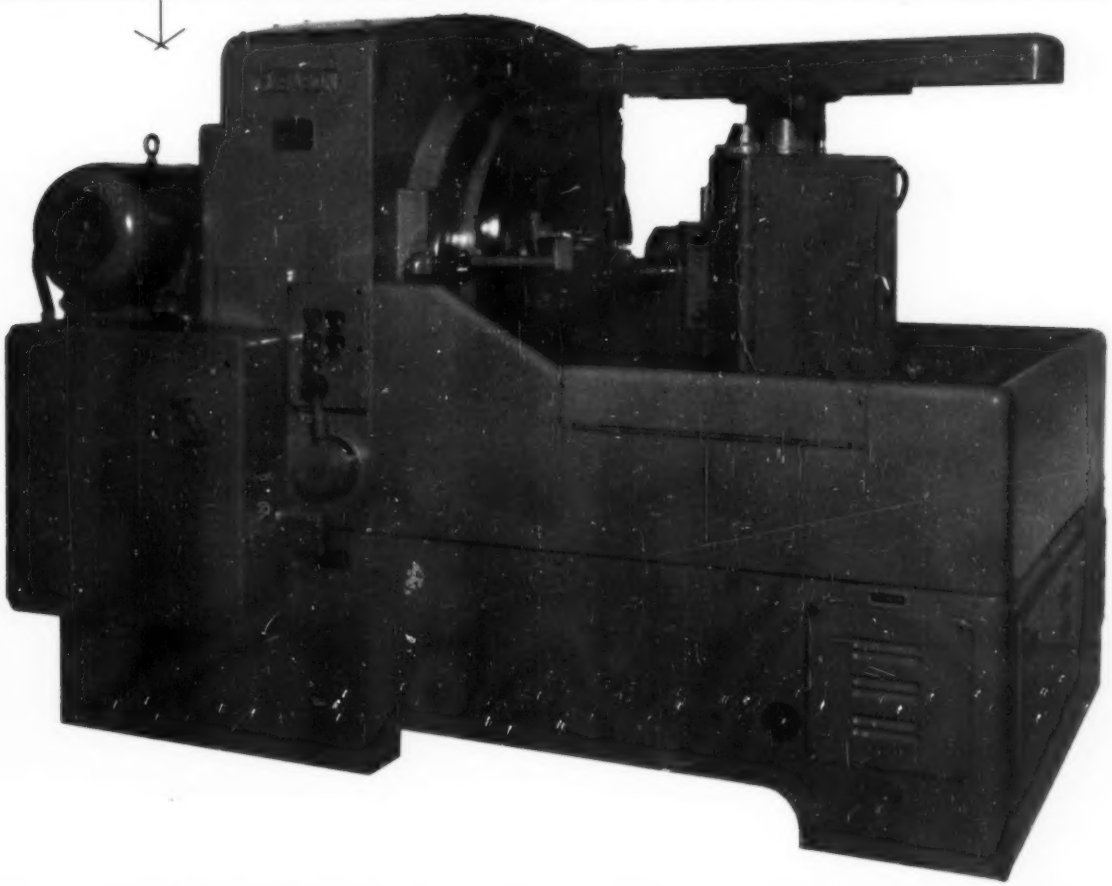
Completing, or separate roughing and finishing, of generated gears and pinions for volume production or small quantities.

ADVANTAGES:

Increased productivity—much faster rates are possible on finishing, and wider range of work can be completed in one operation . . . Improved quality . . . Set-up and tooth bearing development procedures are simplified.

FEATURES:

Use of cam-actuated generating motion increases cutting cycle efficiency . . . New type cutter spindle mounting gives greater rigidity, permits easier cutter truing on generator . . . Machine settings are simplified and permit use of all current spiral bevel, ZEROL bevel, and hypoid gear cutting systems.



GLEASON WORKS GLEASON **ROCHESTER 3, N.Y.**

No. 104
Angular Hypoid Tester

for bevel and hypoid gears up to 4¼" diameter.

APPLICATION:

Rolling test of composite tooth error, as well as power running test.

ADVANTAGES AND FEATURES:

More precise testing over a wide range of gear specifications . . . Three sizes of interchangeable spindles available for various gear sizes . . . Recording unit makes permanent chart of test results . . . Electric drag brake and wide range of speeds provided for running test.

No. 104
Spur Gear Tester

for spur and helical gears up to 4½" center distance.

APPLICATION:

Rolling test of composite tooth error, as well as power running test.

ADVANTAGES AND FEATURES:

One tester now provides both of above types of test for small spur and helical gears . . . Same features as No. 104 Angular Hypoid Tester—three spindle sizes, electronic recording unit, power testing facilities . . . Wide range of adjustments provided to accommodate various gear sizes and specifications.

No. 104
CONIFLEX® Cutter Sharpener

APPLICATION:

Sharpening disc-type cutters used on No. 2A and No. 104 Straight Bevel CONIFLEX Generators.

ADVANTAGES AND FEATURES:

Wet grinding, with automatic stroke and feed control, assures longest cutter life . . . Exact sharpening angles are easily set and maintained . . . Machine set-up and changeover are simplified, for faster, more accurate, sharpening.

GLEASON

GLEASON WORKS · ROCHESTER 3, N.Y.

You can depend on TRICLENE® D (TRICHLORETHYLENE) the rugged degreasing solvent

Made by Du Pont • Pioneer Manufacturer of Degreasing Fluids

Over 20 years' practical and technical experience went into the making of today's "Triclene" D. Each year of research brought new improvements as Du Pont chemists kept pace with the changing demands of metal cleaning. And here's the result—a dependable, top-quality solvent that's in step in every way with today's industrial needs.

Vapor degreasing with rugged "Triclene" D is speeding metal cleaning in thousands of plants. Operators like the way it goes after stubborn buffing compounds, greases and oils; management is sold on its narrow boiling range that simplifies solvent recovery. Both have profited from the friendly, expert assistance of Du Pont and their local distributors. This valuable service can be yours, too—just write: E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Department, Wilmington 98, Delaware.

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first in solvents for
VAPOR DEGREASING

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Please send me the literature checked below:

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- ☐ "Triclene" D — an improved vapor degreasing solvent.
- ☐ "Metal degreasing — standard practices."
- ☐ Du Pont publication, "MODERN METAL FINISHING". (Please add my name to the mailing list).

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... and each a "blue-chip" product

Boring Mills
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Axle Burnishing Lathes
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Car Wheel Lathes
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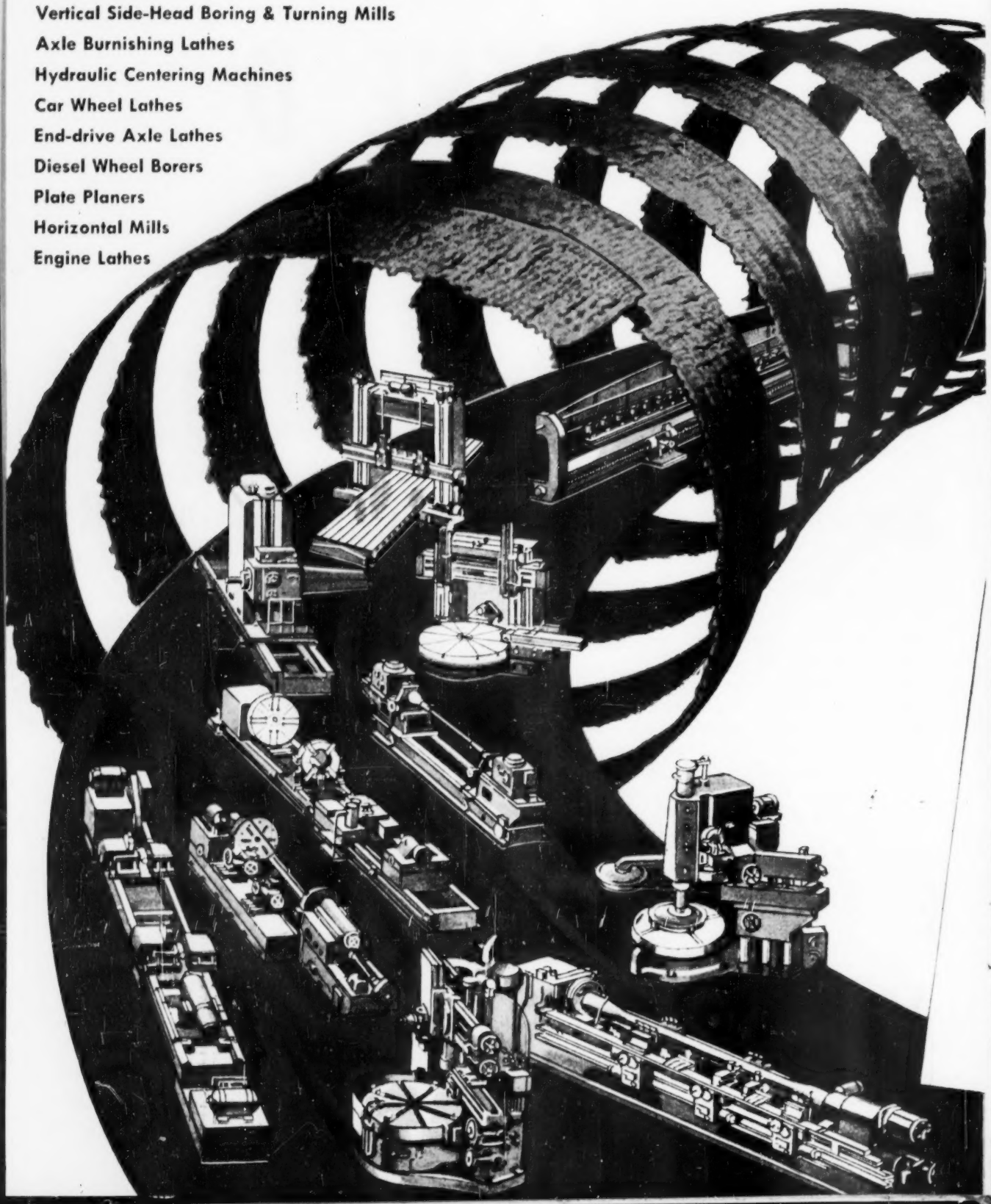
Engine Lathes



HOW NILES ENGINEERING

helps output take a turn for the better

Engineering machine-tool giants that can hog out ¾-inch chips . . . then finish cut to ten-thousandths . . . is our business here at Niles. And after a century of such specialization, we *know* how to engineer the big tools to give you big output.

How big a machine tool do you need? We've built many of the largest ever made . . . lathes with 10-foot swing . . . planers with a 23-foot clearance between housings . . . boring mills with 43-foot swing.

Do you need extra power? All Niles tools are designed with extra rigidity and more power . . . designed to shrug off the stresses of deep cuts and modern feeds and speeds with carbide tipped tools.

Do you need precision plus? We make Niles tools heavier and more powerful, but we also build them to the highest precision standards . . . build them to give you consistent, close, sustained accuracy. That's the reason they're top favorites with the close tolerance manufacturers of precision instruments, ball bearings, tools, dies, and other machine tools.

So why not check Niles when you tool-up. Niles is one of the *great* names in machine tools . . . and the payoff to you is in a *greater* output with *greater* accuracy, over a *greater* number of years.

Why not write *today* for Catalog 91551.

Write to
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Hamilton, Ohio

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In this method

of Tool and Die Making —you Buy Less Steel and Reduce Machining Costs

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Gives you full details on FCC Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steel Specialties capable of saving you time and money.

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ADDRESS DEPT. AM-45

FCC Cast-To-Shape, the modern method of tool and die making, is effecting important savings of time, trouble and money for an increasing number of manufacturers.

Even very intricate shapes can now be cast successfully within an eighth inch of finished size. This means that you buy less steel at the start and reduce machining costs substantially.

Tools which could not be made by conventional methods except in sections can often be fabricated from FCC Cast-To-Shape blanks in a single piece.

In many instances performance of the tool is better than can be obtained by fabrication from bar stock or forgings.

Particulars are available through Allegheny Ludlum representatives; or write for the booklet today.

● Allegheny Ludlum Steel Corporation, Forging and Casting Division, Wanda and Jarvis Avenues, Detroit 20, Michigan.

For complete **MODERN** Tooling, call

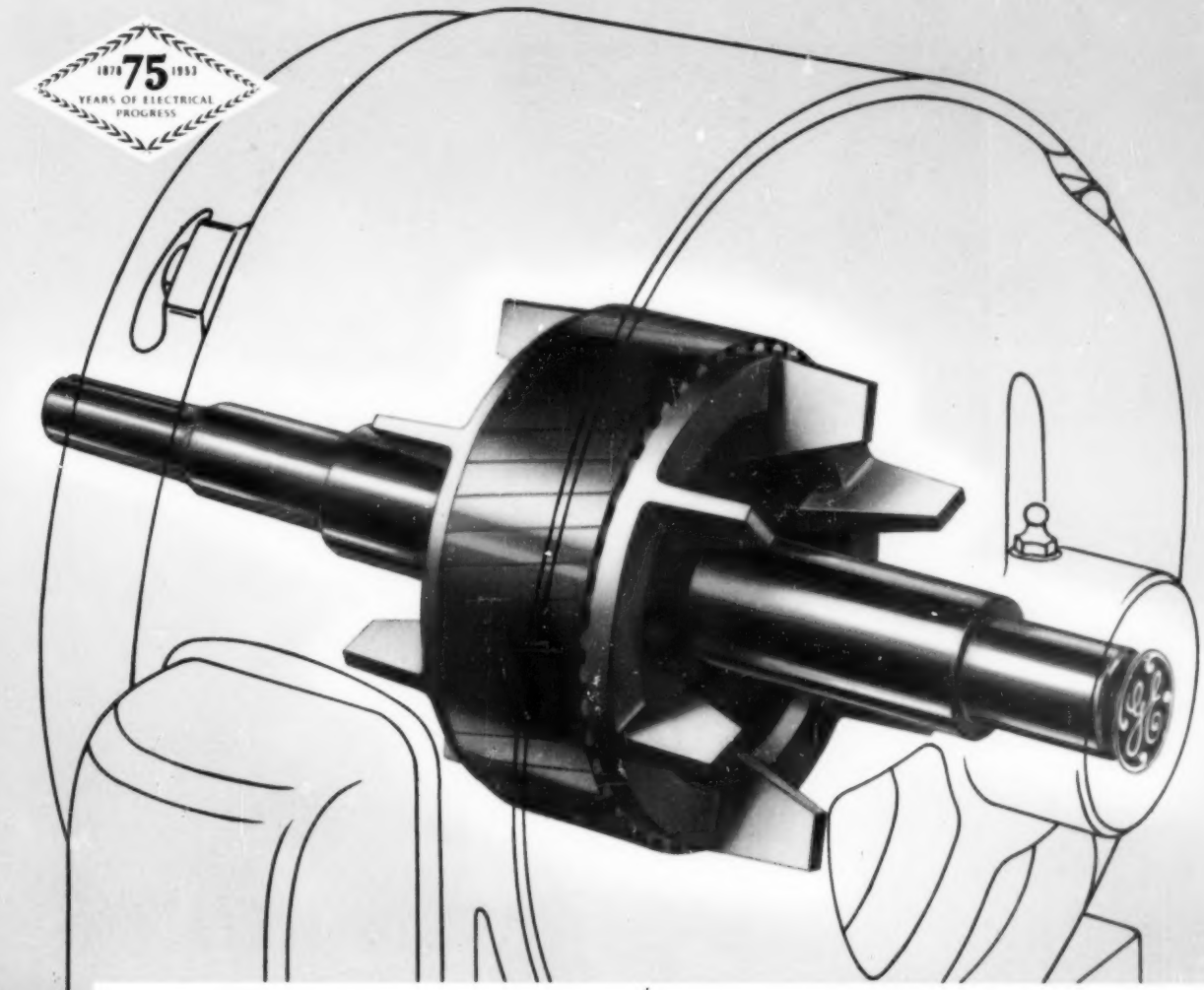
Allegheny Ludlum

W&D 3668

AL

FINE TOOL STEELS SINCE 1854

1878 75 1953
YEARS OF ELECTRICAL PROGRESS



Why rotors don't fail in G-E TRI-CLAD motors

G-E pioneering and research developed and produced this one piece cast-aluminum rotor winding, which has virtually eliminated rotor failures in Tri-Clad motors.

Rotor is indestructible in service because the bars, end rings, and fans are a "one-piece" casting. No brazed joints, no fabricated fans to come apart.

Rotor inertia is reduced by the lightness of the aluminum, thus raising efficiency and allowing easier starting, stopping and reversing.

Rotor efficiency is higher, operating losses reduced, as the result of a special chemical treatment.

The motor runs cooler because the integrally cast fans dissipate heat faster.

Operation is smooth and quiet due to the dynamic balancing of the rotor which also reduces bearing wear and material fatigue.

Long rotor life is one more reason why G-E Tri-Clad motors last longer — give you more reliable service and greater operating economy.

Order Tri-Clad motors today from your nearby G-E representative. You'll find popular models in stock. General Electric Co., Schenectady 5, N. Y.

752-20

You can put your confidence in—

GENERAL ELECTRIC

THE PRESS THAT WORKED ITSELF *INTO* A JOB!

This KRW 150-ton motor-driven Hydraulic Press works all day—every day—testing dies made by Phinney Tool & Die Co., Medina, N.Y. Some of these dies are small enough to fit in the palm of your hand; others weigh up to thousands of pounds.

Phinney had one interesting experience that demonstrates the amazing versatility of this Press. They received an order for a series of 4 progressive dies from a maker of tank parts. Phinney made the dies, tested them, and shipped them. A short time later the dies came back. They were excellent, but the customer didn't have a press large enough to run them. Would Phinney put the dies in production on the same Press that made the sample parts? Phinney accepted. And this same KRW Hydraulic Press has since turned out thousands of tank parts in addition to its regular work of testing dies.

You'll find the versatility and rugged construction of KRW Hydraulic Presses can save you time and money on many operations in your shop. 25-150 ton capacities; one, two or three cylinders; hand, air or motor driven. Write us for complete specifications and prices. Dep't. 11.

Maximum size Bed and Platen on 100 and 125 ton models—40" x 60"; on 150 ton models—36" x 60".

K·R·WILSON

215 MAIN ST., BUFFALO 3, N. Y.

Designers and Builders of the Right Hydraulic Press to Solve Your Metal-working Problems!

MONARCH SERIES 60 LATHES

1 Totally enclosed gearbox and end gearing — for sustained accuracy

2 Automatic pressure lubrication — for long life at original efficiency

3 All anti-friction bearings — for peak power and reduced maintenance

4 Hardened, ground or shaved, wide helical gears in headstock — for precision power, easier shifting

5 American Standard Camlock Spindle Nose — for quick, rigid chuck and fixture mounting

6 Flame-Hardened and Precision-Ground Integral Bedways — for sustained accuracy throughout the life of all four ways

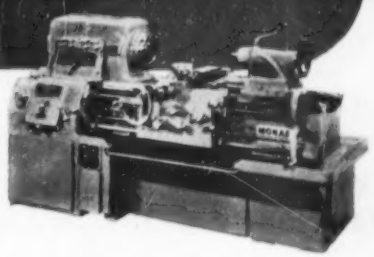
7 All critical parts made of hardened alloy steel — for long, trouble-free life

To get Utmost Value OUT OF YOUR LATHE— Buy Series 60 Value BUILT INTO your Lathe

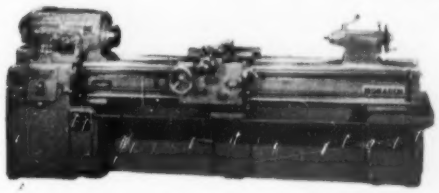
Isn't it logical? Aren't the costs and quality of your products directly affected by the sustained accuracy, speed, versatility and dependability of your turning equipment?

So look over the Monarch Series 60 product features listed above (bearing in mind that almost all of them were Monarch pioneered). Check the extra strength, weight and power of the machines, making them, within their rated capacity, fully capable of sustained heavy production. Then look over the wide choice of accessory equipment that lends such versatility to the basic Engine and Toolmaker's models. This includes (with Monarch only!) choice of three types of Tracer Controls — including the Air-Gage Tracer which, with further addition of the Auto Cycle Unit, gives you a fully automatic cycle high production unit.

For utmost lathe value for toolroom, production line or maintenance shop — look into the Monarch Series 60! Let us send our Booklet No. 1113 with complete information. Just write! . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*



Monarch Series 60 Engine Lathe. Series 60 models are furnished in 13", 16", 20" and plus-swings.



Monarch Series 60 Toolmaker's Lathe. All Series 60 Models are furnished in a wide variety of bed lengths.

Monarch
TURNING MACHINES

ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER TURN TO MONARCH

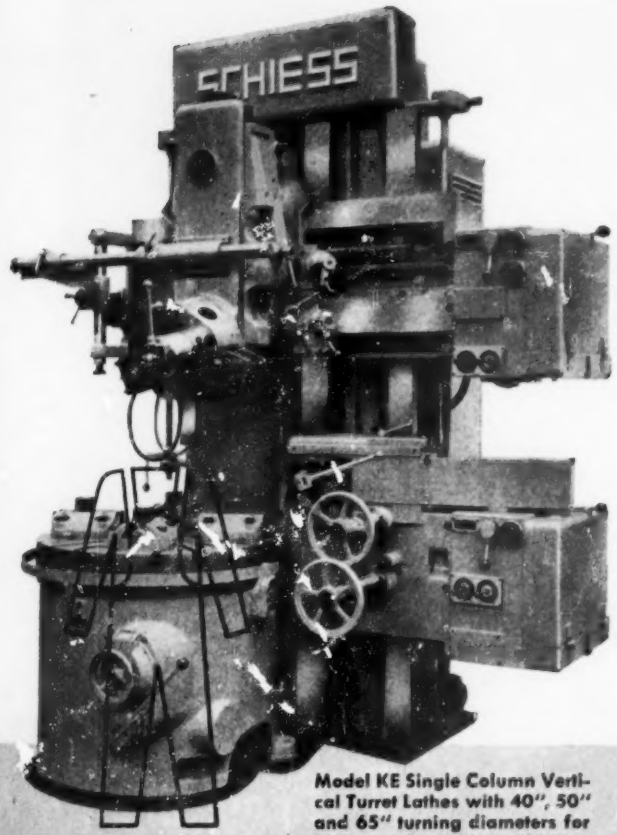
Hydraulic pre-selection of speeds set by handwheel and read on illuminated dial. 16 spindle speeds—ratio 1:50—up to 310 rpm for carbide machining on Model KE 100. Table runs on tapered roller bearings.

Fingertip control for direction of feed and rapid traverse with spring-loaded mono-levers for normal direction plus angular compound feeds. Mono-levers move in same direction as desired feed or traverse movement, simplify correct setting by operator. Specially designed electro-magnetic disc clutches disengage feed instantly with no over-riding or coasting.

Counterbalanced cross rail and side head. Single lever unlocks, raises or lowers, and locks cross rail simultaneously by electro-mechanical controls. *No bolts or nuts to loosen or tighten by hand.*

All-vertical gear drive with main motor mounted on back of machine, directly connected to gear box. Changes in direction of drive transmitted to table without bevel gears, eliminating vibration and backlash.

Copying attachment with electric tracer for use either on cross rail or side head.



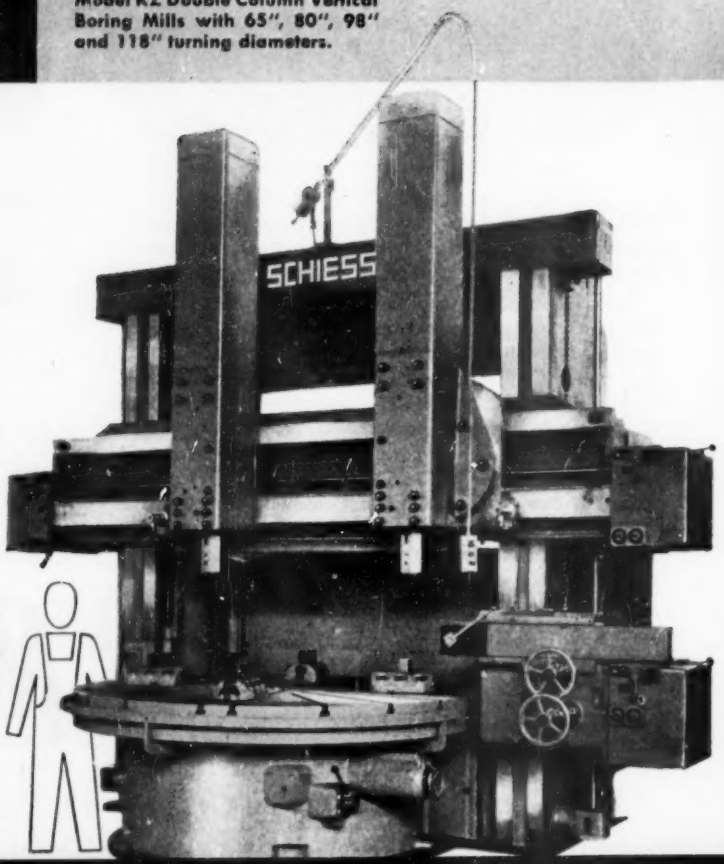
Model KE Single Column Vertical Turret Lathes with 40", 50" and 65" turning diameters for high-speed carbide machining.

NEWLY DESIGNED

VERTICAL TURRET LATHES AND BORING MILLS

like these -

Model KZ Double Column Vertical Boring Mills with 65", 80", 98" and 118" turning diameters.



All operating features of KE Series Vertical Turret Lathes are combined in the

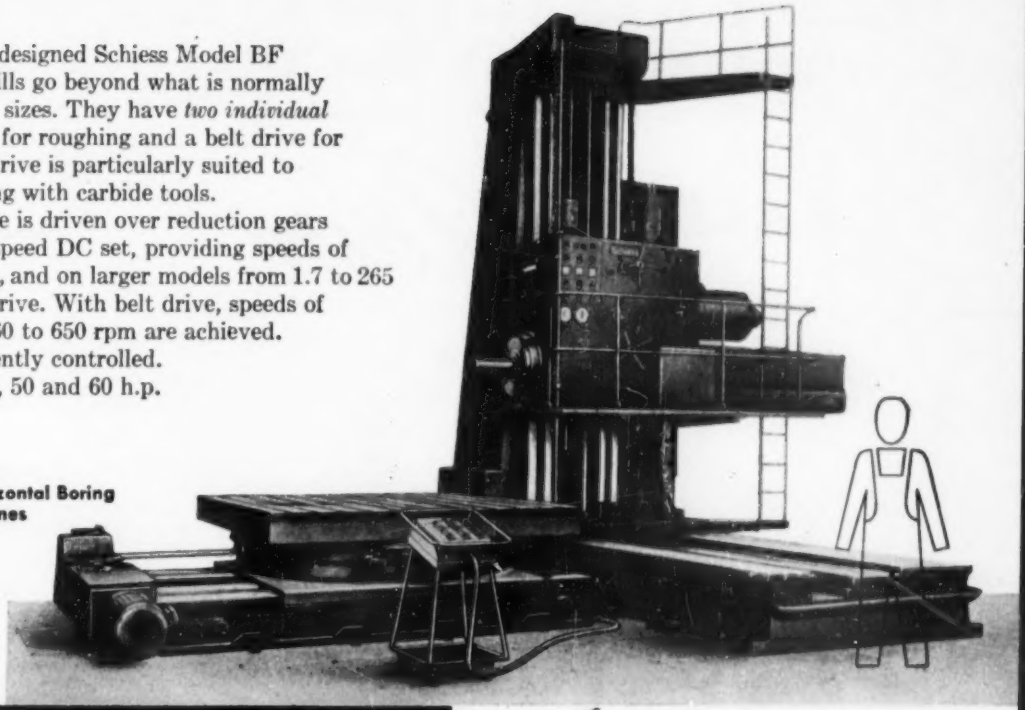
SCHIESS KZ DOUBLE COLUMN VERTICAL BORING MILLS, PLUS—

Heads equipped with steel octagon rams can be swiveled—have automatic feed in vertical, horizontal and angular direction and are independent of one another as to amounts and direction of feed. Table operated by three-button pendant control.

Schiess factory engineers are now permanently located at American Schiess Corporation's Pittsburgh Service Center to install and service Schiess equipment, train operators and consult with your engineers on special-purpose equipment.

These completely redesigned Schiess Model BF horizontal boring mills go beyond what is normally considered standard sizes. They have *two individual drives*—a gear drive for roughing and a belt drive for finishing. The belt drive is particularly suited to high-speed machining with carbide tools.

The boring spindle is driven over reduction gears through a variable speed DC set, providing speeds of from 2.7 to 325 rpm, and on larger models from 1.7 to 265 rpm with the gear drive. With belt drive, speeds of 30 to 750 rpm and 60 to 650 rpm are achieved. Rams are independently controlled. Main motors are 40, 50 and 60 h.p.



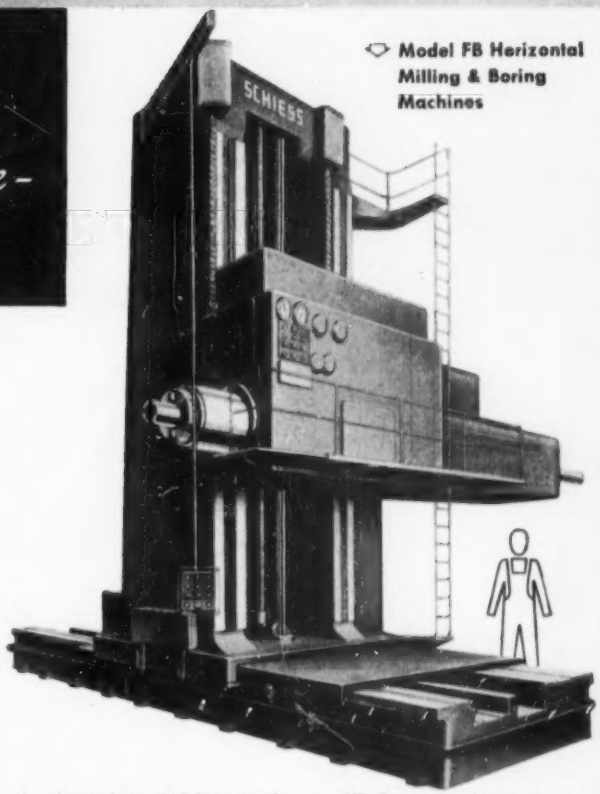
Model BF—Horizontal Boring & Milling Machines

NEWLY DESIGNED

HORIZONTAL BORING & MILLING MACHINES *like these*-

Standard sizes begin where other builders end

Spindle Diameters 6¼", 7½", 8⅞", 10⅜", 12⅜"



Model FB Horizontal Milling & Boring Machines

An entirely new development...

SCHIESS HORIZONTAL MILLING & BORING MACHINE

Here is a radically new departure in machine tools—the Schiess Model FB horizontal *milling* and *boring* machine. Rugged and precise, the Model FB is primarily designed for heavy milling cuts and for certain types of facing work. These limited specifications tell only part of the story of this unique machine:

Specifications	FB 28/16	FB 32/19	FB 36/22.5
Diameter of Milling Spindle.....	11"	12⅜"	14¼"
Diameter of Boring Spindle.....	6⅜"	7½"	8⅞"
Diameter of Milling Spindle Sleeve	18⅞"	21¼"	24"
Maximum diameter bored.....	35½"	55"	86½"
Maximum diameter faced.....	55"	86½"	102"
Main Motor.....	60 h.p.	60 h.p.	85 h.p.

Gear Drive for roughing, Belt Drive for finishing

An American Schiess engineer will show you how you can adapt this new type heavy producer to your special needs.

Engineering Division

AMERICAN SCHIESS CORPORATION

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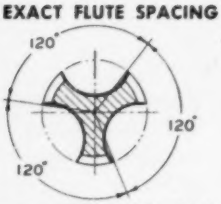
Rochester, Michigan, U. S. A. Distributors in principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco. Division of National Twist Drill & Tool Co.

1 EXACT FLUTE SPACING



It is accomplished by high precision indexing.

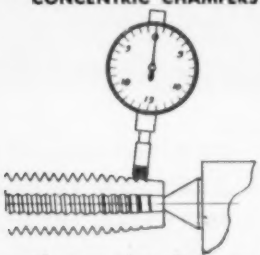
2 UNIFORMITY OF FLUTE CONTOURS

You can't get true Balanced Action without this.

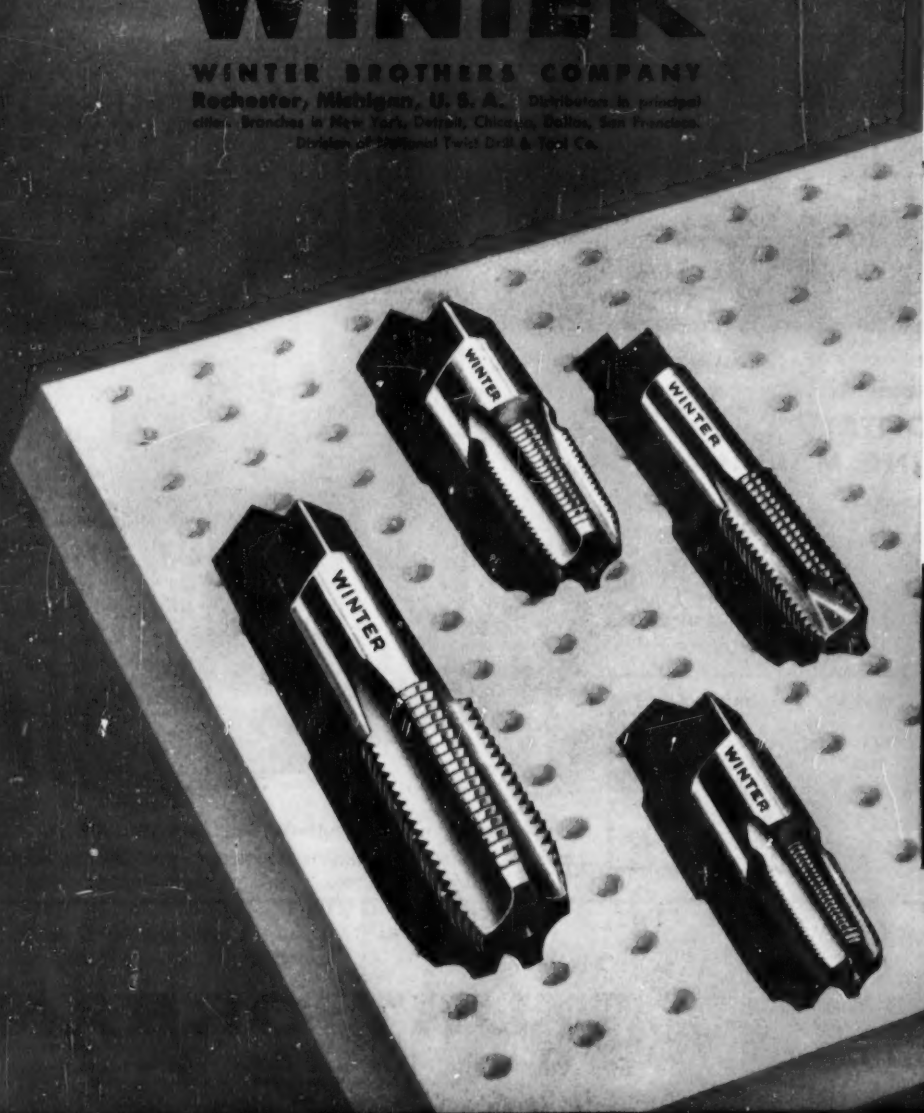
3 PRECISION CHIP DRIVER CONTOURS

They are *exact* to size, shape, and position.

4 ACCURATE AND CONCENTRIC CHAMFERS



—with very close limits on shank and thread.



ALWAYS AT YOUR SERVICE

Your local Industrial Supply Distributor carries complete stock of WINTER Taps.

WITH HIGH HELIX ANGLES—
WITH *National* CUTTING EDGES

these "Helex" End Mills give long, faithful service. They're "smooth operators"—even when you push them with high speeds and feeds!

NATIONAL TWIST DRILL AND TOOL COMPANY
Rochester, Michigan, U. S. A. Distributors in principal cities.
Factory Branches: New York • Detroit • Chicago • Dallas • San Francisco

CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

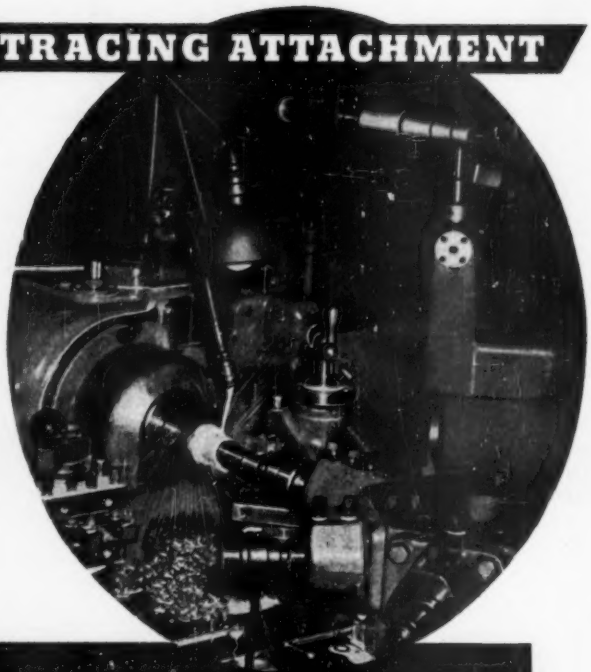
. . . for all your simple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs and special tools.

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

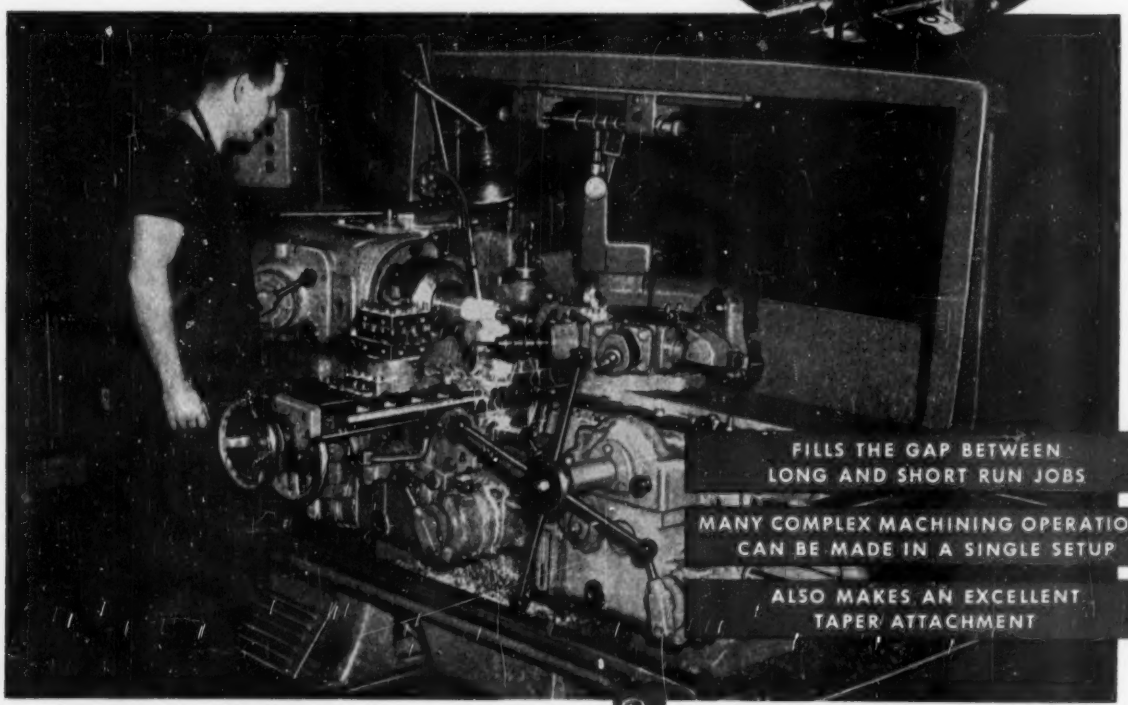
National

NEW HYDRAULIC TRACING ATTACHMENT

for J&L turret lathes*



Will reduce your costs —direct and indirect— by combining in a single machine all the advantages of TRACING for contour turning, boring or facing operations, with the advantages of multiple tooling and the many other time saving, cost saving features of J & L Universal Turret Lathes.



FILLS THE GAP BETWEEN LONG AND SHORT RUN JOBS

MANY COMPLEX MACHINING OPERATIONS CAN BE MADE IN A SINGLE SETUP

ALSO MAKES AN EXCELLENT TAPER ATTACHMENT

*RAM TYPE or No. 7 SADDLE TYPE

P.S. This attachment can be purchased with new machines or installed in the field on machines now in service. Write for descriptive leaflet giving complete specifications.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

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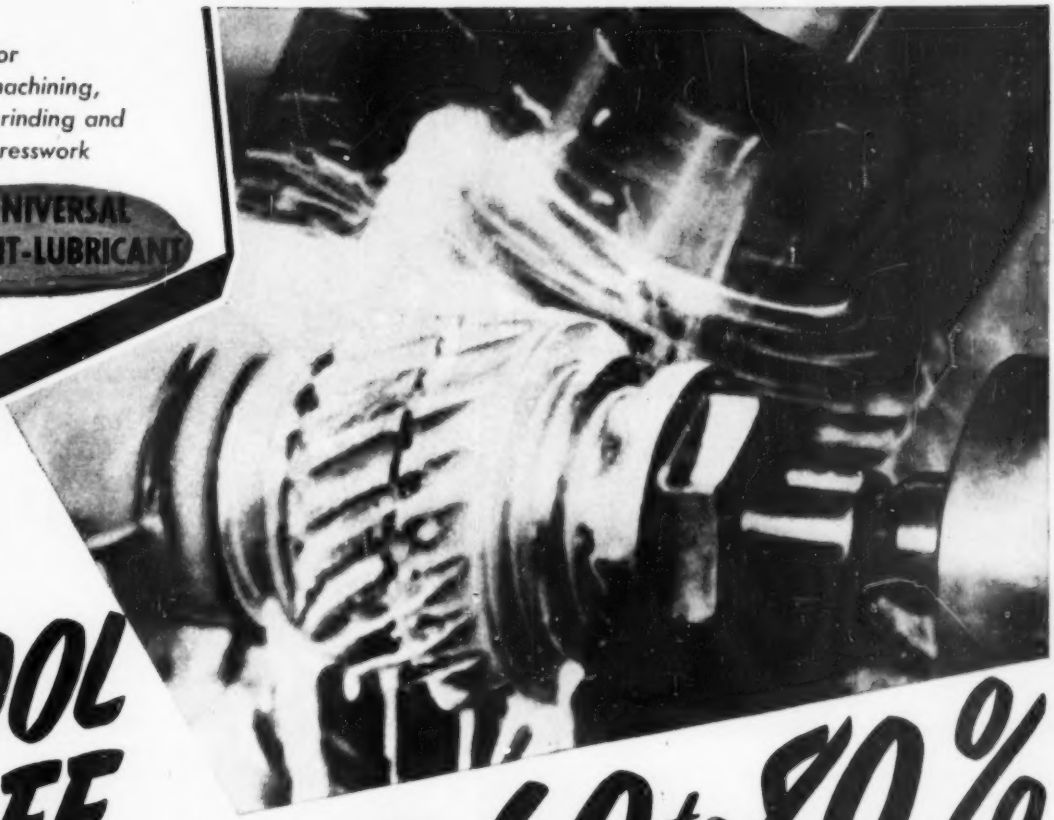
J&L TURRET LATHE DIV.

for machining, grinding and presswork

A UNIVERSAL COOLANT-LUBRICANT



TOOL LIFE BOOSTED 60 to 80% WITH SHEAR-SPEED SOLUBLE OIL!

machine down-time cut in the production of gears for a large auto manufacturer.

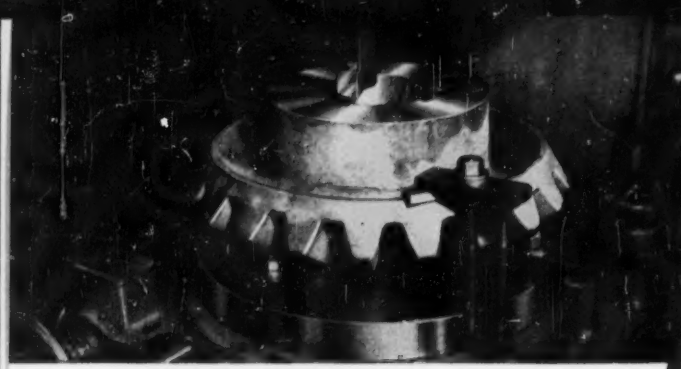
IMPARTIAL TESTS of two highly-rated cutting fluids vs. SHEAR-SPEED Soluble Oil were run under *exactly similar production conditions:* ***same machine, same parts, same cutting speed, same coolant flow, same tool grinding***

	Cutting Fluid X	Cutting Fluid Y	SHEAR-SPEED Soluble Oil	S/S Soluble Oil Gave This:
Average No. gears cut per grind	177.6	193	228	More pieces per grind
Tool stock removed per grind	.0227"	.0288"	.0188"	Less tool wear
No. of grinds per .375" hob wear	16	13	20	Longer tool life
Average tool life	2842 parts	2509 parts	4560 parts	Lower tool cost per piece

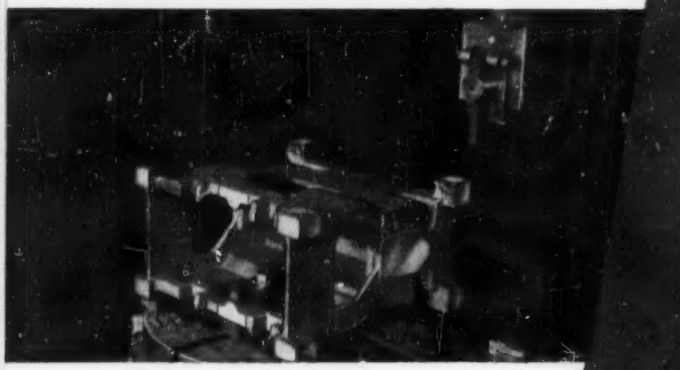
Convince yourself of the **amazing** advantages and versatility of SHEAR-SPEED Soluble Oil in your own plant. Sold only on a **satisfaction guaranteed** test basis. Write for **Bulletin SO-53** and price list.

SHEAR SPEED
CHEMICAL PRODUCTS

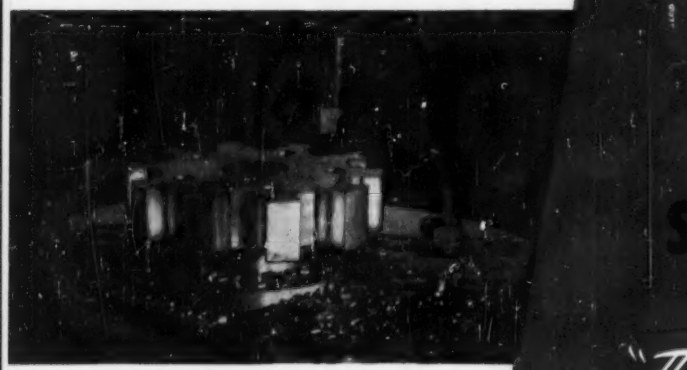
7175 E. McNICHOLS RD. *A Division of Michigan Tool Co.* DETROIT 12, MICH.



The two keyways in this big, 445 pound, cast iron gear are 90° apart; back of slots taper ⅛" per foot. Finish machining — requiring removal of ⅛" of metal hardened to over 50 Rockwell—was accomplished in 64 minutes with a single set-up.



A P&W Vertical Shaper machined the *thirty-five* different surfaces and irregular shaped slots in this box jig . . . without a single change of set-up.



This 6-inch punch of die steel is another job completed in a single set-up without special fixtures of any sort. Notice the intricate form required in each segment.

MORE

JOBS
SHAPES
PROFITS

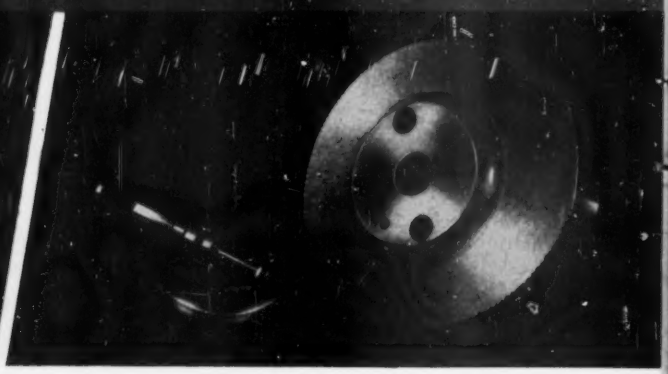
LESS

WORK TIME
SET-UP CHANGES
SPECIAL FIXTURES

OR

"The Handiest Machine in Your Shop"

Figure this performance in your own profit picture. A Pratt & Whitney Vertical Shaper accurately machined this die and shoe in just 8¼ hours . . . saving 34¾ hours over former methods.

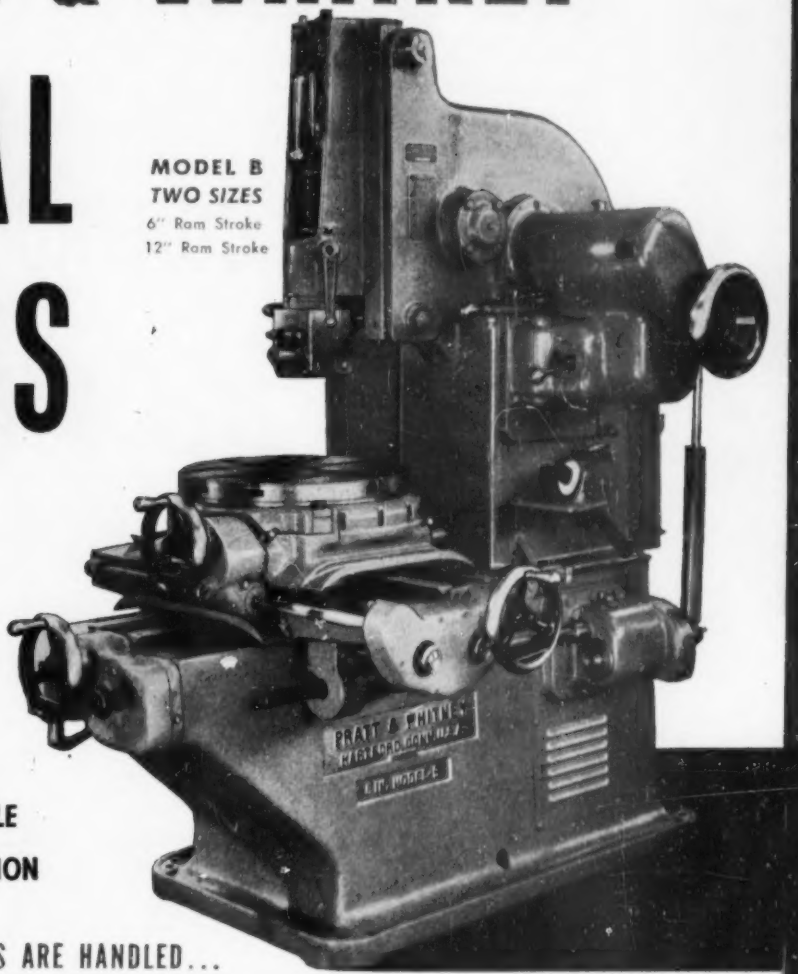


Power rotary feed to the table pays off . . . by producing for example, small quantities of cams and similar pieces when regular equipment is not available. This cam was machined in 3 hours.

PRATT & WHITNEY

VERTICAL SHAPERS

MODEL B
TWO SIZES
6" Ram Stroke
12" Ram Stroke



- **DEPENDABLE ACCURACY**
- **CONVENIENT OPERATION**
- **RIGID, RUGGED CONSTRUCTION**
- **BETTER VISIBILITY**
- **ACCURATE INDEXING**
- **POWER ROTARY FEED to the TABLE**
- **HEAVY CUTTING with FINE PRECISION**

EVERYWHERE THAT IRREGULAR SHAPES ARE HANDLED...

in the die shop, tool room or repair shop, Pratt & Whitney Vertical Shapers will machine your difficult jobs faster, more accurately and more profitably. Versatile, powerful, accurate — they handle a wide variety of pieces that cannot be machined economically by any other method.

P&W vertical design transfers cutting pressures directly to the table and bed, eliminating springing and assuring permanent accuracy. Cutting action tends to hold the work in place. This feature — plus the built-in rotary table with power feed — makes work holding and indexing simple. Costly set-up changes and expensive jigs and fixtures are practically eliminated. Open construction with no overhanging tool head permits better visibility and provides easy accommodation for a wide range of work sizes.

SEND NOW FOR COMPLETE INFORMATION — Write on your Company letterhead to the Pratt & Whitney Branch Office nearest you or direct to West Hartford; ask for Circular No. 423-7.

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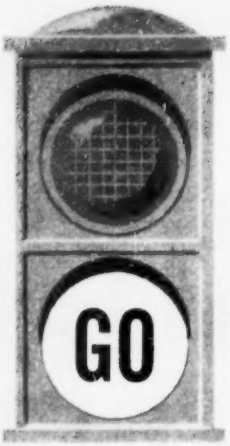
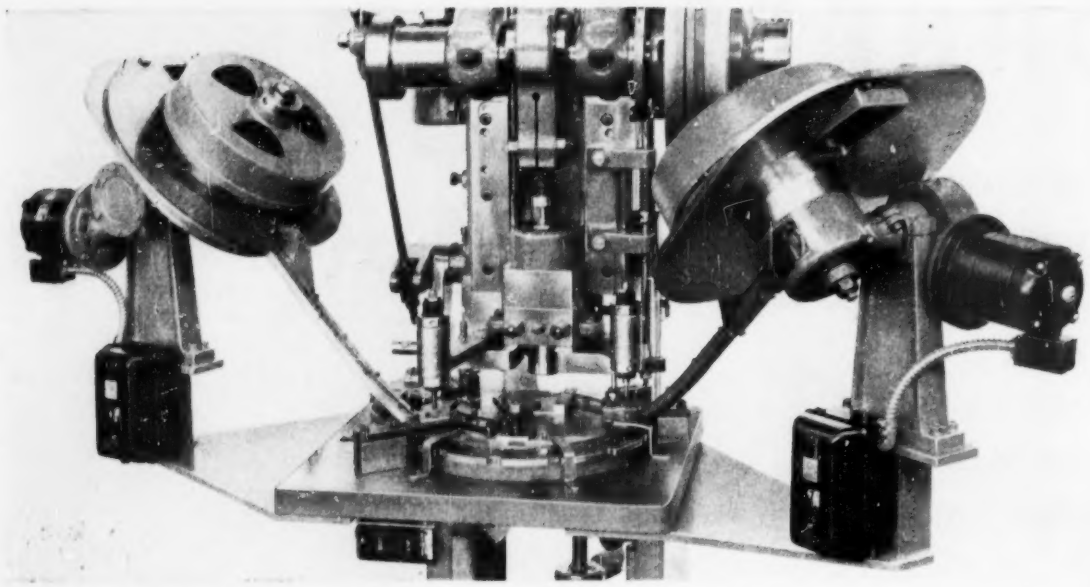
MACHINE TOOLS • CUTTING TOOLS • GAGES

When you run V & O long slide presses you can inspect an occasional few of your stampings and be sure that the others are exactly like them. And when you can do that, when your machines operate with such consistent precision that random or chance imprecisions are statistically unlikely, then you have quality control.



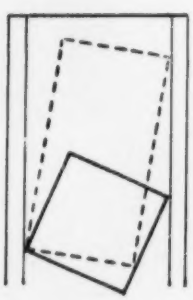
FOR QUALITY CONTROL GO V&O



V & O long slide press that automatically feeds and assembles two parts from their individual hoppers, 128 strokes a minute.

INVITATION TO INGENUITY

V & O long slide design provides space for precision-promoting tooling. Ingenious design can apply moving and stationary members that make random operating imprecisions statistically unlikely.



THE LONG SLIDE PRINCIPLE

eliminates the random imprecisions that can come from stroke misalignments.

The longer the slide the less can be the angular misalignment.

THE V & O PRESS COMPANY

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HUDSON **NEW YORK**

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

Only the best is good enough

"STANDARD for tough jobs since 1881"

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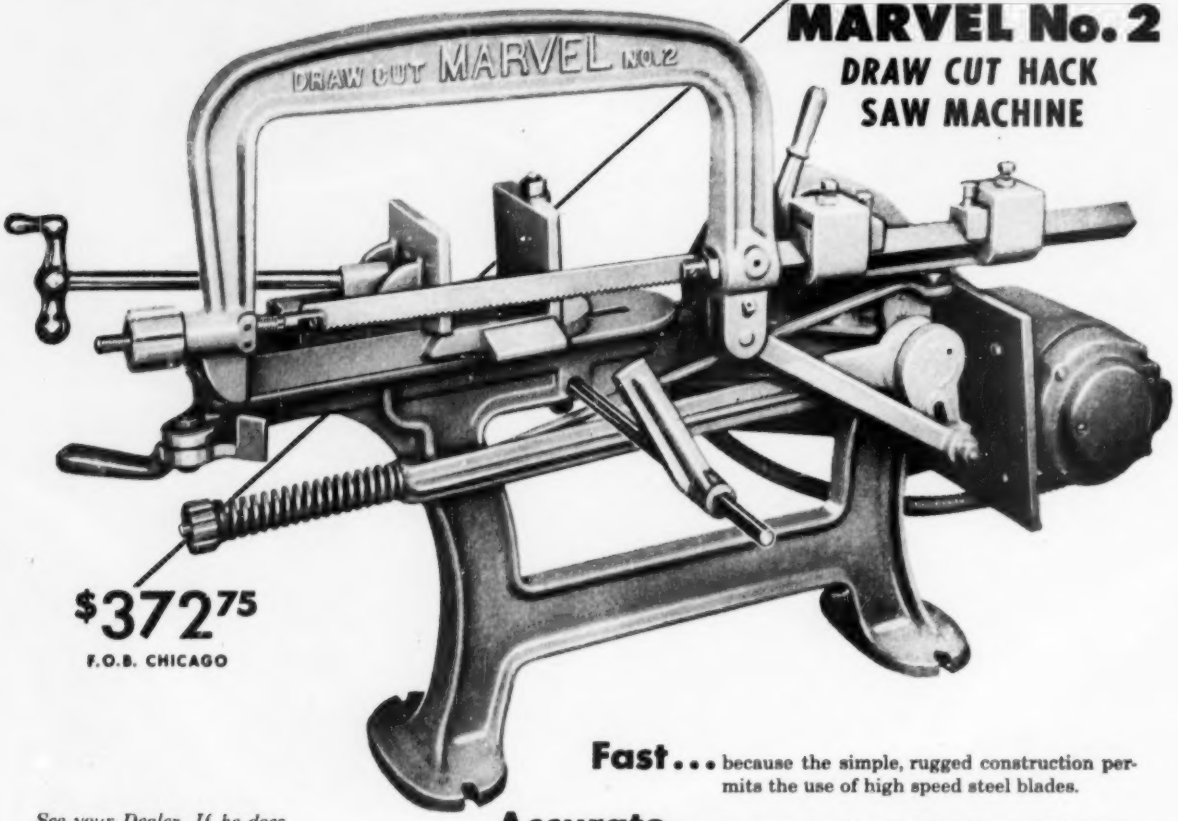
For... General-Purpose Sawing

FAST—ACCURATE—ECONOMICAL—DRY CUTTING

Capacity up to 8" round

Improved MARVEL No. 2 DRAW CUT HACK SAW MACHINE



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Fast... because the simple, rugged construction permits the use of high speed steel blades.

Accurate... because the improved Saw Frame with clamping type blade holders holds the blade in perfect alignment and proper tension.

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Dry Cutting... because modern high speed steel blades will operate efficiently at 60 strokes per minute without a coolant.

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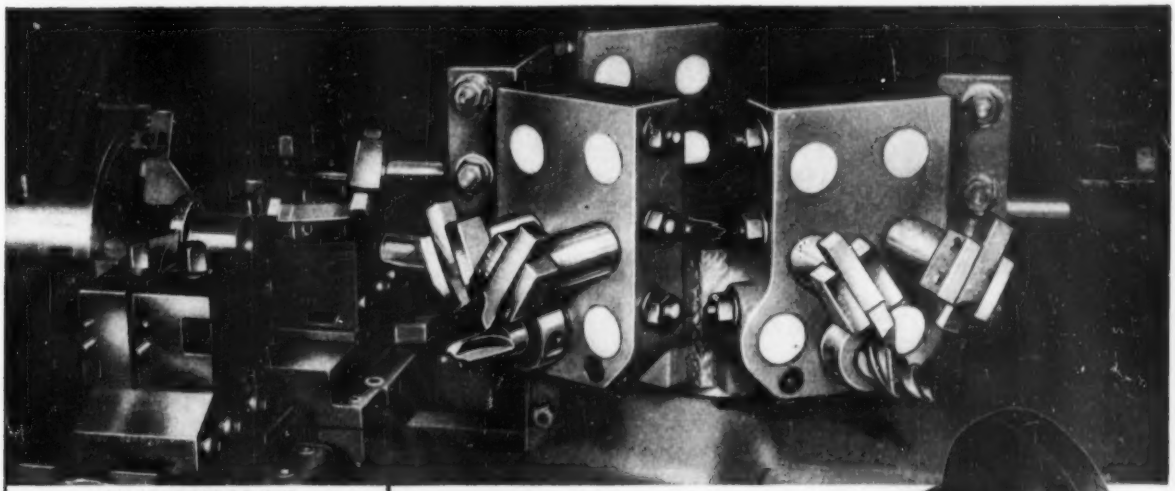
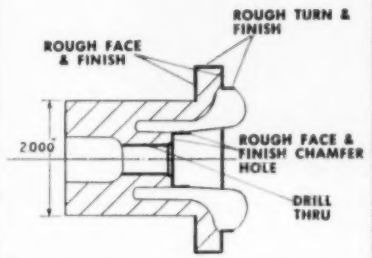
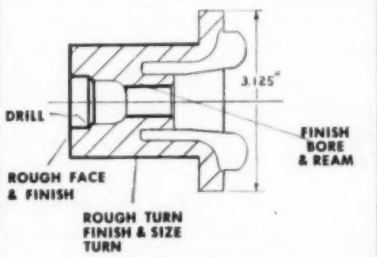
FINISHED in ONE TURRET CYCLE in 2.66 MINUTES with a 3U SPEED-FLEX AUTOMATIC TURRET LATHE Plus P & J TOOLING



FIRST OPERATION
(PART CHUCKED ON 2" DIA. HUB)





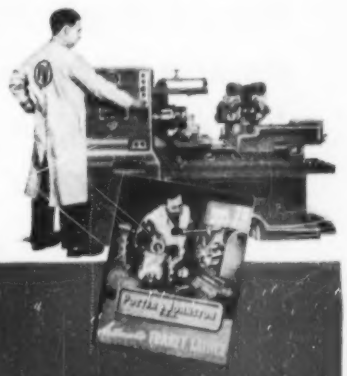
SECOND OPERATION
(PART CHUCKED ON 3.125" O.D. OF BLANK)
HEAVY LINES INDICATE MACHINED SURFACES

GREY IRON CASTING

When faced with machining jobs like this, call on P&J Tooling Engineers. With the P&J 3U Speed-Flex, and carbide cutting tools, 20 pieces per hour are produced. All operations are automatic, one operator easily handles several machines, and labor costs go down.

This automatic turret lathe has the versatility of spindle speeds from 73 to 1445 rpm, is equipped with four automatic speed changes and three automatic feed changes for each set of pick off gears, six turret faces, a means for operating a slide tool on the turret, and two cross slides that work independently or simultaneously.

When versatility, automatic operation and multiple work surfaces are combined with P&J special Tooling Service, better pieces at lower costs result. Your operators will like the Model 3U with its spindle speed selector and push button controls.



STILL WANT PROOF? Just submit sample parts and prints for tooling recommendations including time estimates for comparison. Also ask for Bulletin 145.

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PAWTUCKET, RHODE ISLAND
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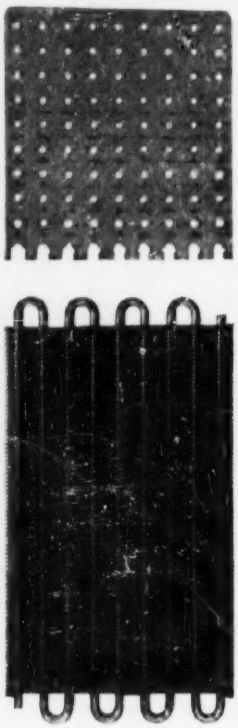
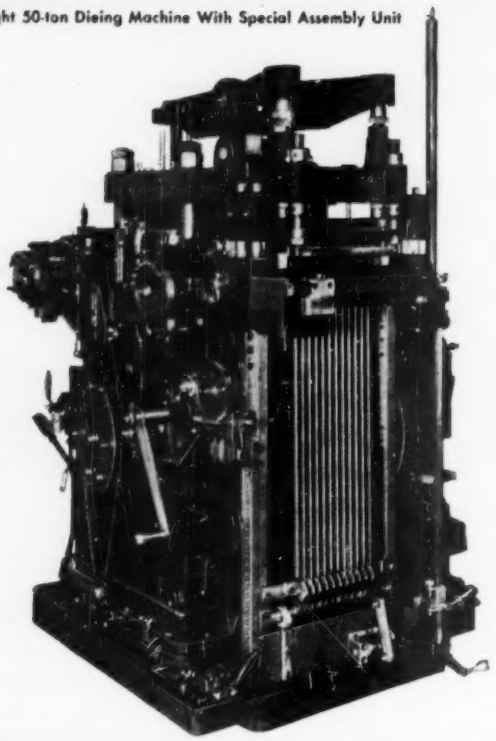
this condenser "assembled for nothing"



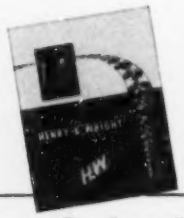
Henry & Wright 50-ton Dieing Machine With Special Assembly Unit



Henry & Wright Dieing Machine stamps out fins and then fits them onto tube at high speed . . .

This single Henry & Wright Dieing Machine does the work of several ordinary presses and a benchful of assemblers. First, the fins are partially completed via progressive stamping, at the rate of 120 strokes per minute. Next, the fins are fed onto the serpentine tube, fitted and cut off from the strip. The operator simply removes completed core and puts a new tube in the assembly fixture.

Combining high speed with long die life, the Henry & Wright Dieing Machine provides a production tool basically designed for new and improved methods. From simple blanking to complex operations, you can count on a price cut with every stroke.



LATEST CATALOG

See how you can use Henry & Wright Dieing Machines to modernize your operations. Write Henry & Wright, 481 Windsor St., Hartford, Connecticut.

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HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

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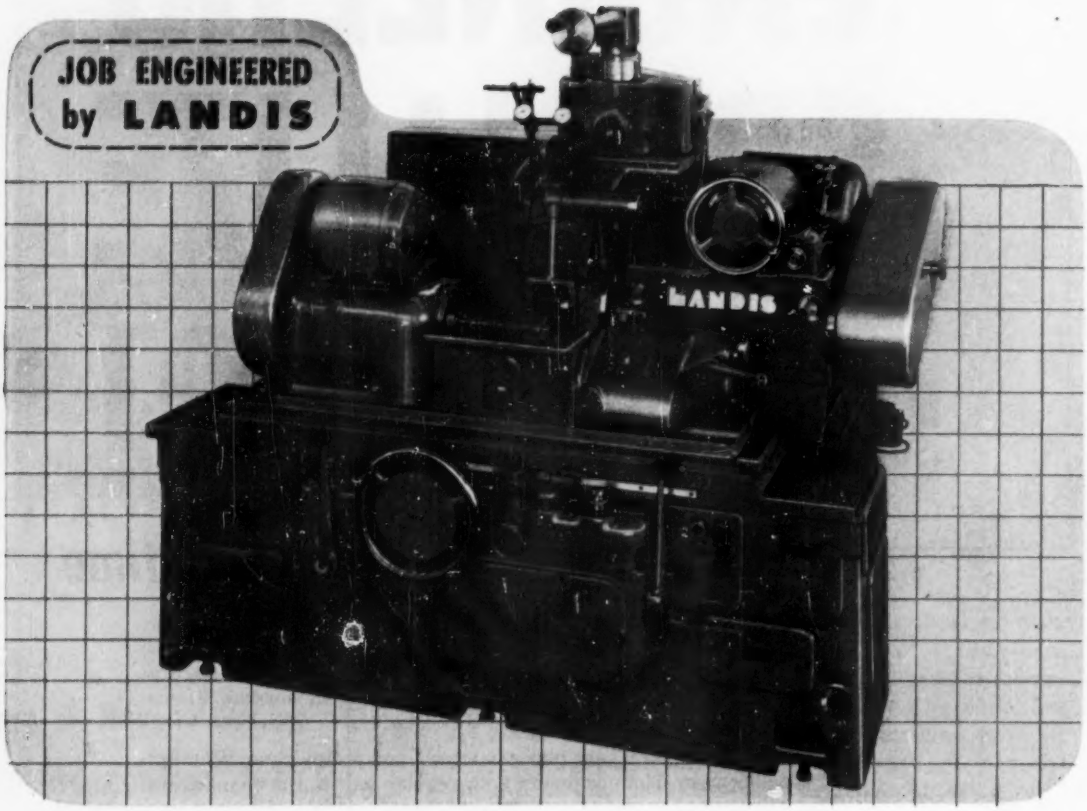
How LANDIS JOB ENGINEERING cuts grinding costs...

Plain Grinder with Spaced Wheels Can Do Work of Two or More Machines



Landis 10" x 18" Type CH Plain Grinder with spaced grinding wheels and hydraulically operated, wheelbase mounted overhead dresser.

136

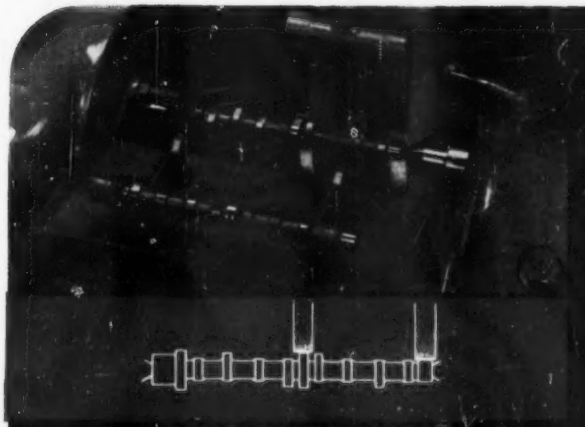
LANDIS

precision grinders

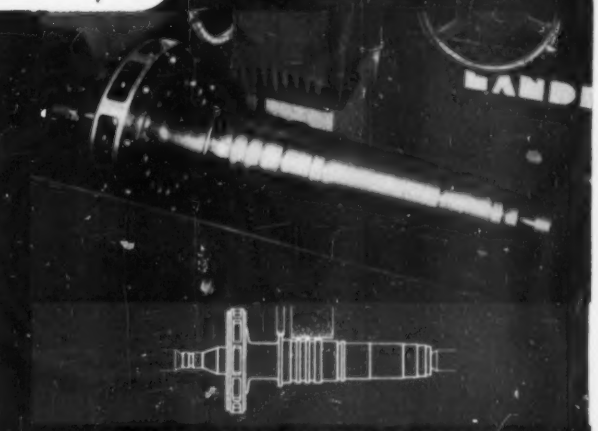
JOB ENGINEERED by LANDIS means ideas that will produce the highest return on your investment. It starts with operator convenience, hydraulic controls and simplified maintenance of a *standard* grinder. Then, on the basis of your requirements of finish, tolerance and production, we apply tooling, such as spaced wheels, to increase production and accuracy.

Landis Grinders are engineered to *your* specific requirements. They give you the fastest return on your investment. Send us your prints for tooling and production estimates. Landis Tool Co., Waynesboro, Pennsylvania, U.S.A.

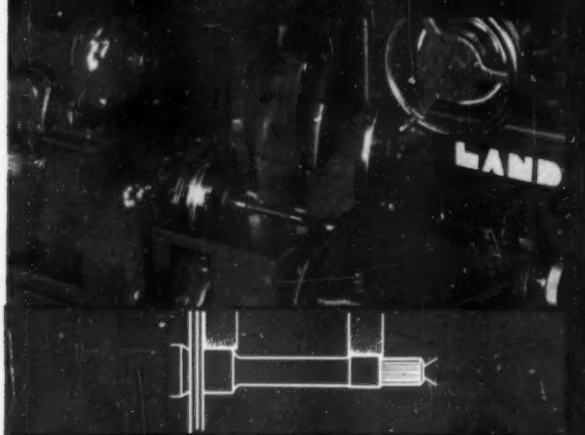
JOB ENGINEERED by LANDIS



CENTER AND END BEARINGS OF CAMSHAFT GROUND IN ONE OPERATION

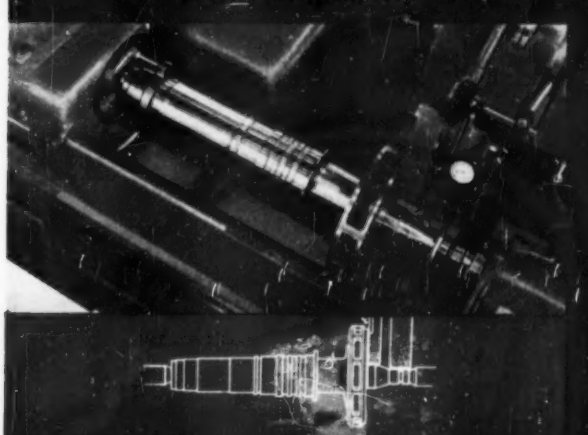


GRINDING VARIOUS DIAMETERS OF PROPELLER SHAFT WITH SPACED WHEELS AND SPECIAL FEED

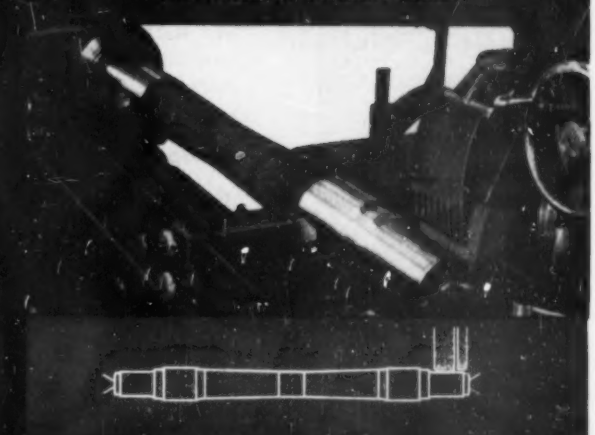


TWO DIAMETERS OF INPUT SHAFT GROUND SIMULTANEOUSLY

OIL PUMP BODY DIAMETERS GROUND WITH TWO WHEELS OF DIFFERENT GRADES

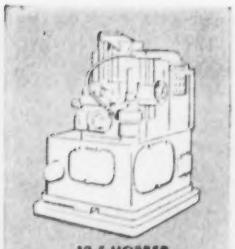


END DIAMETERS OF PROPELLER SHAFT GROUND IN ONE OPERATION

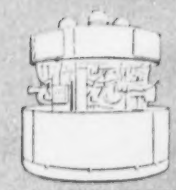


SPACED WHEELS WITH RADIUS ON CORNERS FOR GRINDING RAILROAD CAR AXLES

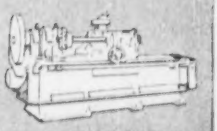
LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA, U. S. A.



12-S HOBBER

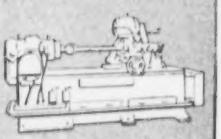


7-A ROTARY HOBBERS

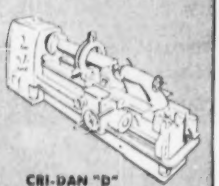


5H SPLINE HOBBER

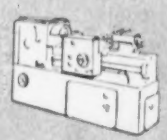
MODEL 40 THREAD MILLER



HT THREAD MILLER



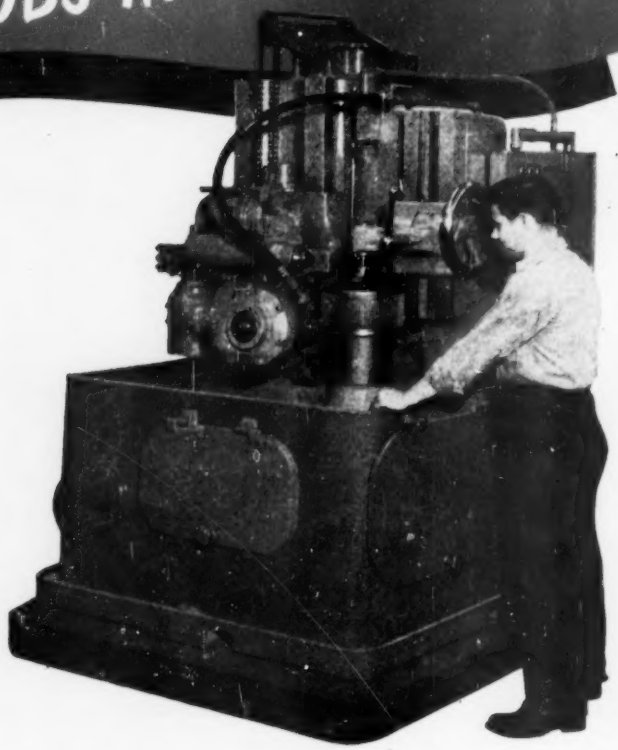
CRI-DAN "D"



CRI-DAN "B"

the Lees-Bradner Model 12-S (semi-automatic)

HOBS IN HIGH GEAR



Lees-Bradner Electric Hob Shifter also available on this model 12-S machine.

Reports from users indicate that the LEES-BRADNER Model 12-S Gear Hobber is truly a remarkable machine.

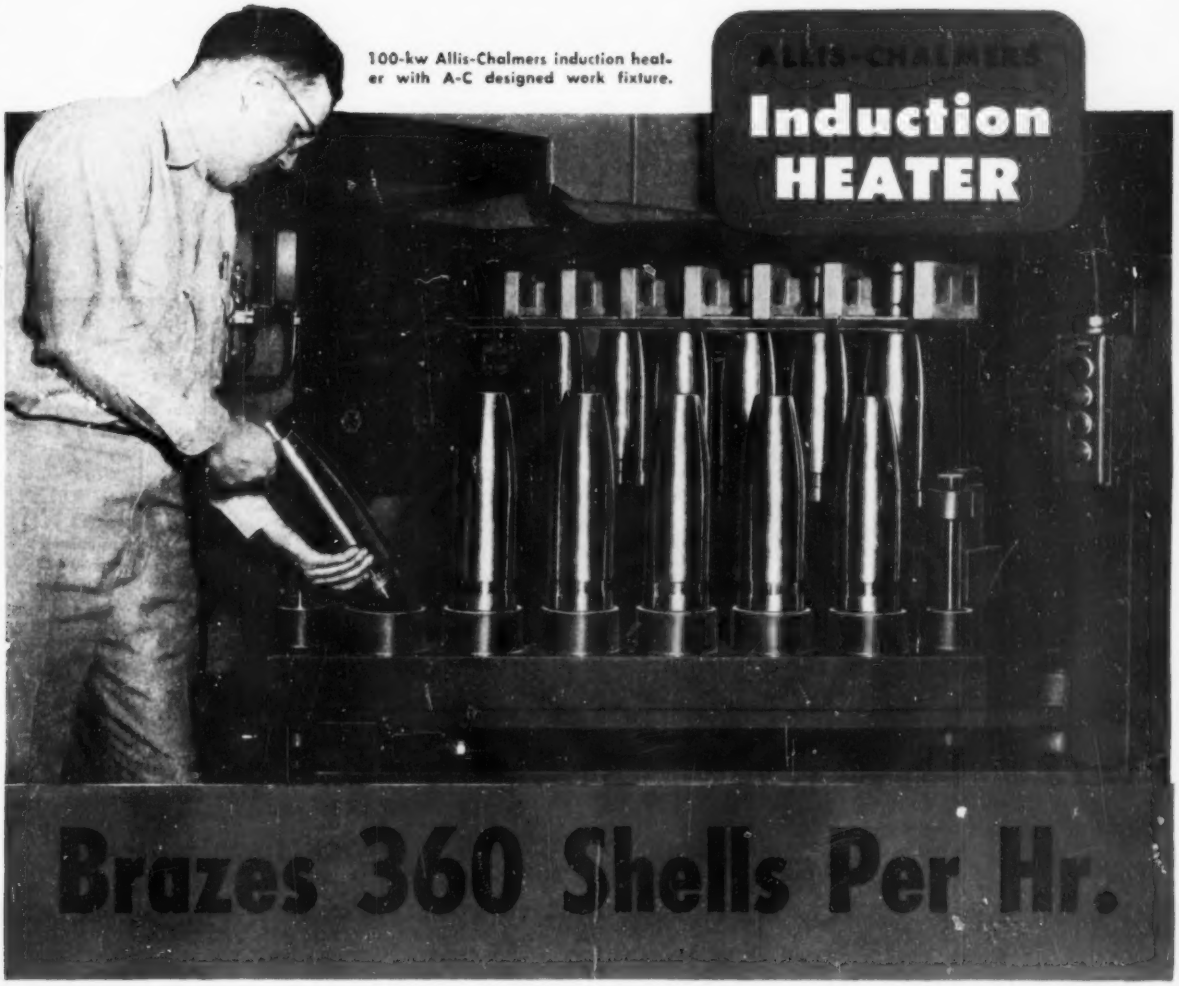
Since it is semi-automatic in operation, even relatively unskilled workers can run it efficiently. Once loaded, the operator merely pushes the start button. The Lees-Bradner In-Out mechanism feeds the hob into depth automatically and, at the end of the hobbing operation, backs the hob out and returns it to starting position.

This efficient machine can produce gears of remarkable accuracy—including right and left hand spur and helical gears up to 45 degrees.

Get in touch with the Lees-Bradner representative in your area or contact the factory direct for detailed information on this money-saving machine.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



100-kw Allis-Chalmers induction heater with A-C designed work fixture.

Brazing nose adaptors on 105 mm projectiles is a tough job. It demonstrates the real potential of Allis-Chalmers induction heaters.

Because of the problems involved, only induction heating is capable of providing the precise heat control required on a high production basis. For example, too much heat will affect the shell and burn the flux. Too little heat and solder will not pull into threads. In addition, heat must be applied at just the right point or solder will flow out of joint without flowing up threads.

Allis-Chalmers induction heaters provide both the high quality and high production required.

This same versatile Allis-Chalmers induction heater can also be used for soldering, annealing, case and through hardening. A simple change of work coils is all that's needed to switch from job to job.

Find out about the spectacular cost reductions you can make in your shop with an Allis-Chalmers induction heater. There may be complete data in A-C's electronic laboratory on a job similar to yours. For complete information call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

SEND FOR

Allis-Chalmers
Milwaukee 1, Wisconsin

Send latest information on Allis-Chalmers induction heaters.

Name .....

Title .....

Company .....

Street .....

City ..... State .....

A-4119

ALLIS-CHALMERS

Adaptable

1 NATCO TWO-WAY DRILLER made up of two HOLEUNITS

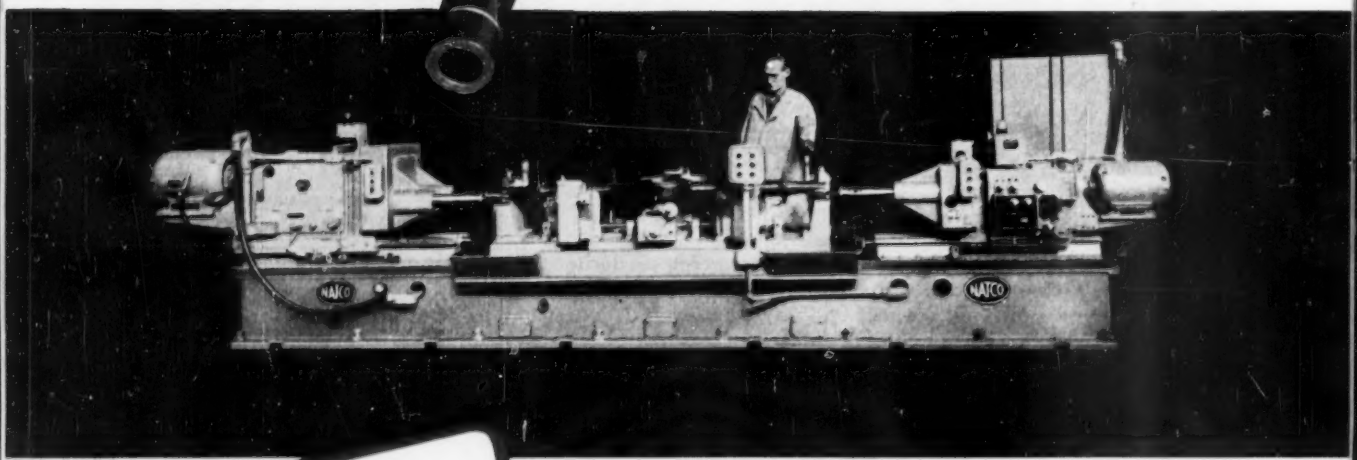
R. H. HEAD Drill one hole for tapered hole (approximately 1/32" smaller than small end of taper)

L. H. HEAD Drill one hole for tapered hole (approximately 1/32" smaller than small end of taper)

L. H. HEAD Drill one hole with multi-diameter tool to remove as much stock for taper as possible.

PART: Axle Housing

PRODUCTION: 30 parts per hour



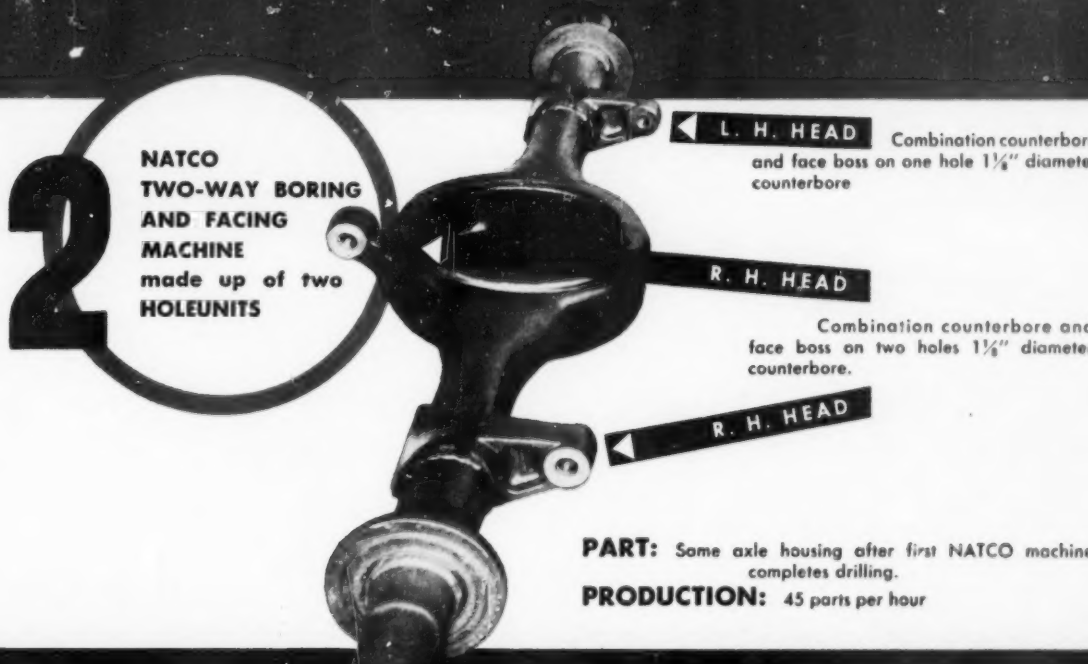
NATCO ENGINEERED for Quality and Quantity Production

NATCO HOLEUNITS ARE FLEXIBLE AND INTERCHANGEABLE . . . They provide standard, compact, self contained hydraulic units which can be arranged in groups to drill, bore, ream, counterbore, hollow-mill, chamfer, face or tap in various sides of a part with a minimum of handling. NATCO HOLEUNITS will operate horizontally or at any angle to form a way type or station type machine. Should the part or parts be altered NATCO HOLEUNITS may be re-arranged with new spindle boxes. Thus you get highly specialized machines with standardized NATCO HOLEUNITS for highest production at low cost. Let a NATCO Field Engineer solve your "hole" problem.

NATCO HOLEUNITS

TEAMED UP FOR ECONOMICAL PRODUCTION

2 NATCO TWO-WAY BORING AND FACING MACHINE made up of two HOLEUNITS



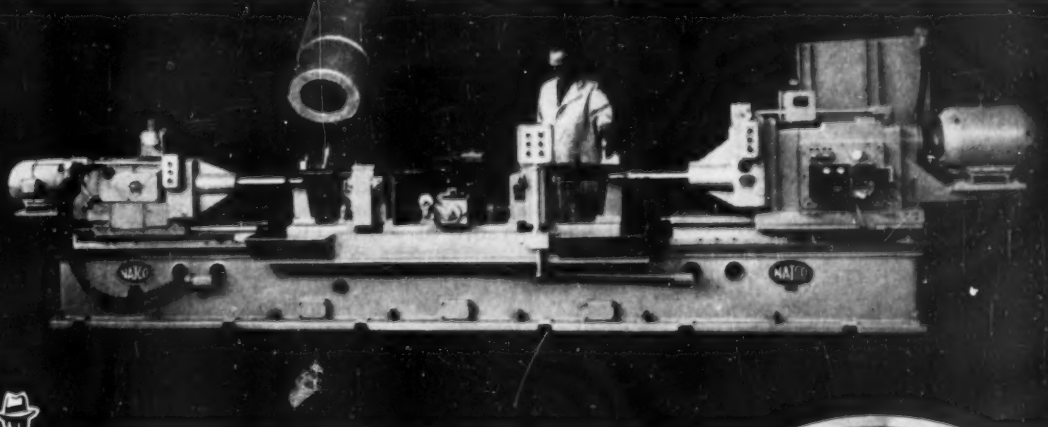
L. H. HEAD Combination counterbore and face boss on one hole 1⅛" diameter counterbore

R. H. HEAD Combination counterbore and face boss on two holes 1⅛" diameter counterbore.

R. H. HEAD

PART: Some axle housing after first NATCO machine completes drilling.

PRODUCTION: 45 parts per hour



Call a Natco Field Engineer

to help you solve your problems in Drilling, Boring, Facing and Tapping.

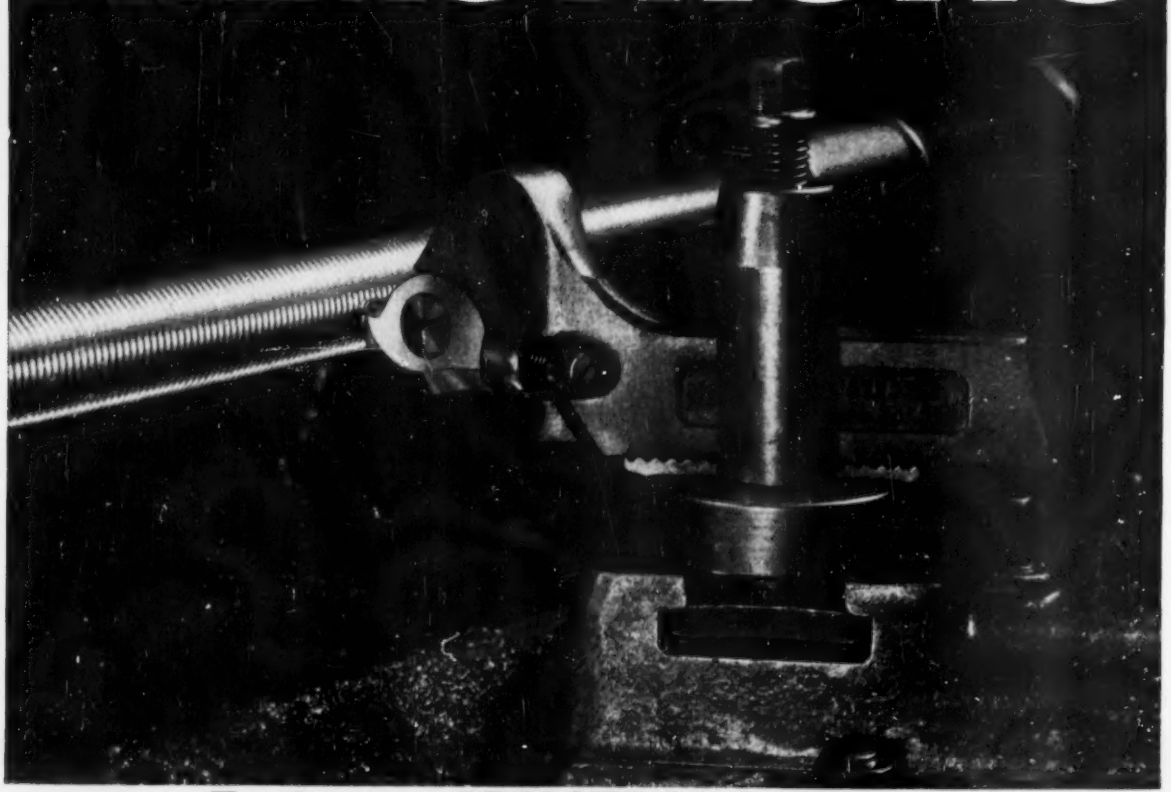
NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

1809 Engineering Bldg., CHICAGO • 409 New Center Bldg., DETROIT
1807 Elmwood Ave., BUFFALO • 2902 Commerce Bldg., NEW YORK CITY

ARMSTRONG



The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

Write for catalog

Each year ARMSTRONG TOOL HOLDERS become more important to you

Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Save: All Forging, 70% Grinding, 90% High Speed Steel."

ARMSTRONG TOOL HOLDERS reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

ARMSTRONG TOOL HOLDERS permit increased speeds and feeds—produce more pieces per hour per machine tool.

ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are quantity produced by modern methods, for a world market . . . are used by over 96% of the machine shops and tool rooms . . . are carried in stock for your convenience by all industrial distributors of consequence.

Buy **ARMSTRONG TOOLS** from your Industrial Distributer

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"
5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

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MACHINE TOOLS
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Kearney & Trecker offers NEW FREE BOOK on solutions to production metalworking problems

THIS illustrated booklet will show you how to make profitable use of our Special Machinery Division's new $5,200,000 expansion. In addition to demonstrating how to use our Customer Engineering Service, the book illustrates typical special machines and tooling already built... the more than $2,000,000 worth of equipment available to work on the machines you need. Fill out and mail this coupon today. There's no obligation, of course.

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Please send me a copy of the booklet "Doorway to a Proven Method for Solving Big and Small Metalworking Problems."

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Title _____

Company Name _____

Address _____

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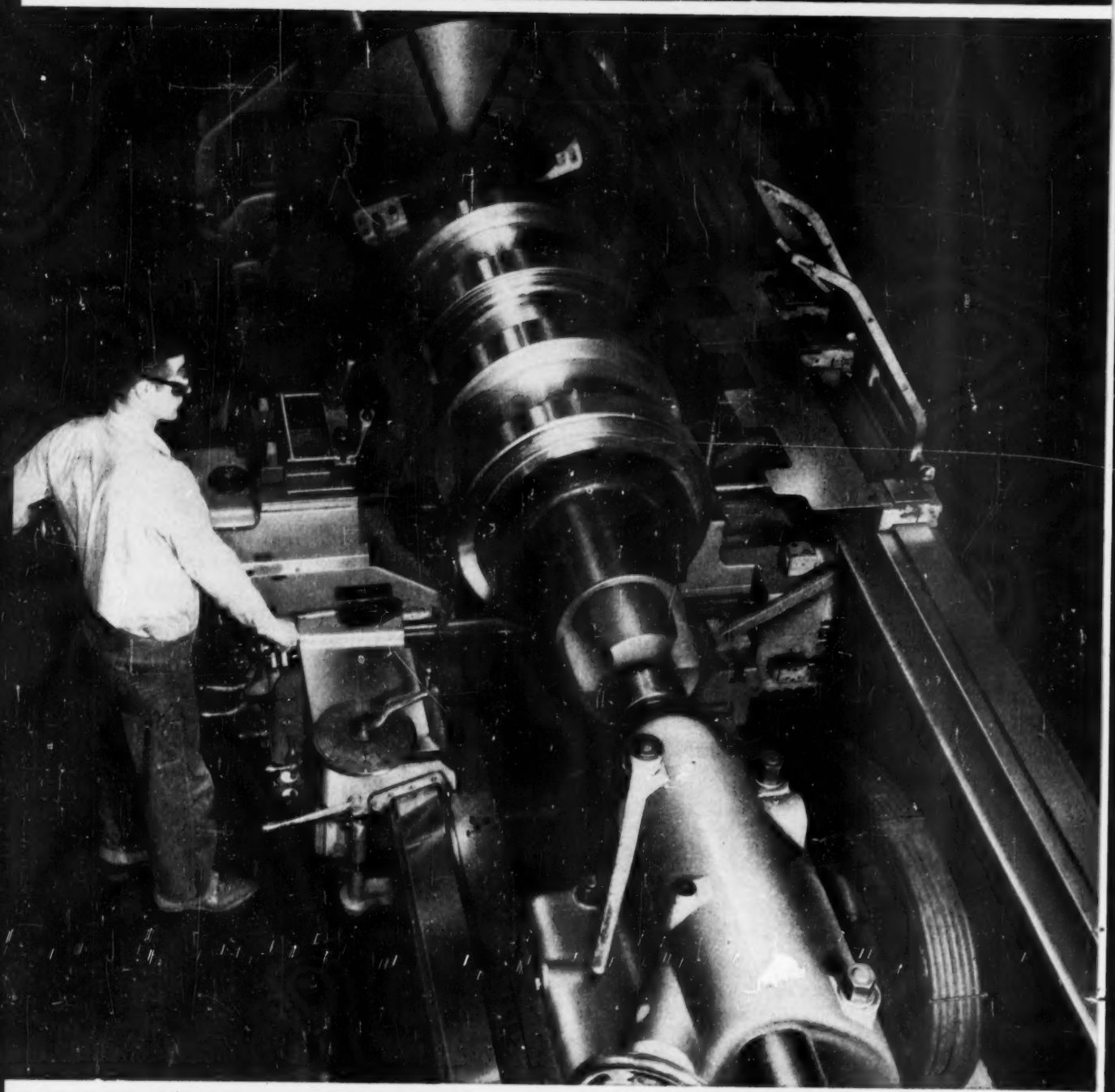
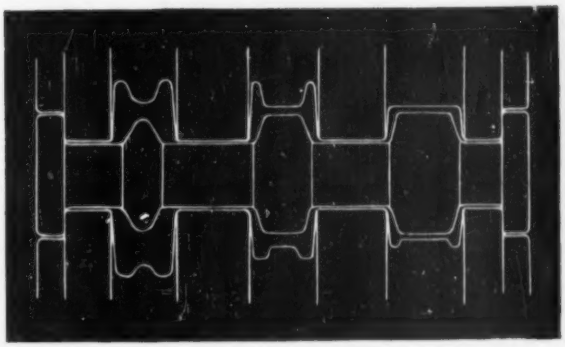
LeBlond Lathe eases cost squeeze ...on rolls that



A set of Shape rolls of 30½" dia. x 51" body cast alloy semi-steel are turned to .005" tolerance in 14 hours on this 50" LeBlond Roll-Contouring Lathe. Set up time: 4 hours. Clamped-on and brazed-on carbide tips are used at 48 rpm, 040 ipr feed. Conventional roll lathe took 45 hours for the same set of rolls.

squeeze channels from blooms

U. S. Steel Lops 151 Hours Off 245-Hour Roll-Turning Job.



Typical roughing rolls for 8" channel

Every day at U. S. Steel's Clairton Works, Clairton, Pa., miles of "hotter-than-orange" steel are squeezed through the passes of rolls like these for reduction, elongation, shaping. They come out as finished structural steel for the "jungle-gym" frameworks of modern buildings. Turning these costly shape rolls with their steep-angle contours used to keep a lathe running *245 hours on a set of roughing rolls* at U. S. Steel. Tool life was short and the job required highly skilled operators. Stepped-up schedules called for a new solution to this tough-nut production problem.

A LeBlond 50" Roll Contouring Lathe, as recommended by Pittsburgh Distributor, Barney Machinery Co., immediately slashed the 245-hour turning time by an astonishing 61.7%. Now U. S. Steel *saves 151 hours on one set of roughing rolls*—more than enough time to turn out two more just like it. Tool life is greatly improved and less experienced operators can handle the work.

The 50" LeBlond Roll Contouring Lathe is equipped with two-directional hydraulic tracing. A single valve automatically controls two hydraulic motors for cross and length feed. A stylus follows a flat template mounted at the back of the lathe. Feed and speed can be varied during a cut without leaving a tool mark. For roughing, hydraulic cross feed can be by-passed and length feed used separately. This enables operator to cross feed manually, use template as length stop. Mechanical power rapid traverse to carriage and cross slide is also provided. All controls are located conveniently at the apron. The lathe uses a 40 constant horsepower DC motor, has nine speed changes in the headstock, delivers infinitely variable speeds from 1 to 165 rpm.

Whether your turning jobs involve specialized production like roll-turning, or call for high precision, high production—investigate LeBlond's complete line of 76 lathe models. LeBlond engineers will help you get a better turning job, faster. Write today or see your nearby LeBlond Distributor.

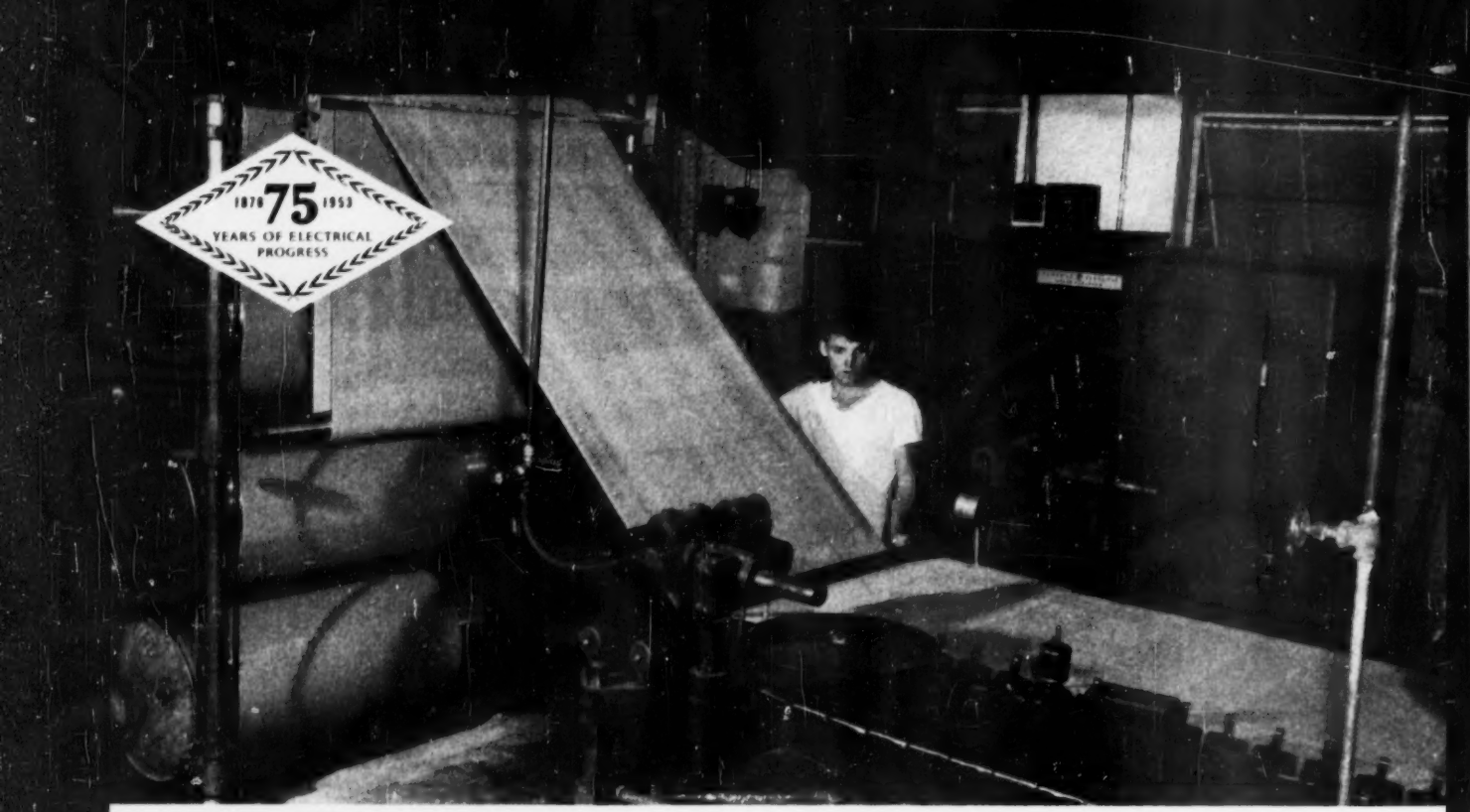
Ask for complete information on Roll Contouring Lathes in 25", 32", 40" and 50" sizes.

Turned faster by

LeBLOND *of Cincinnati*

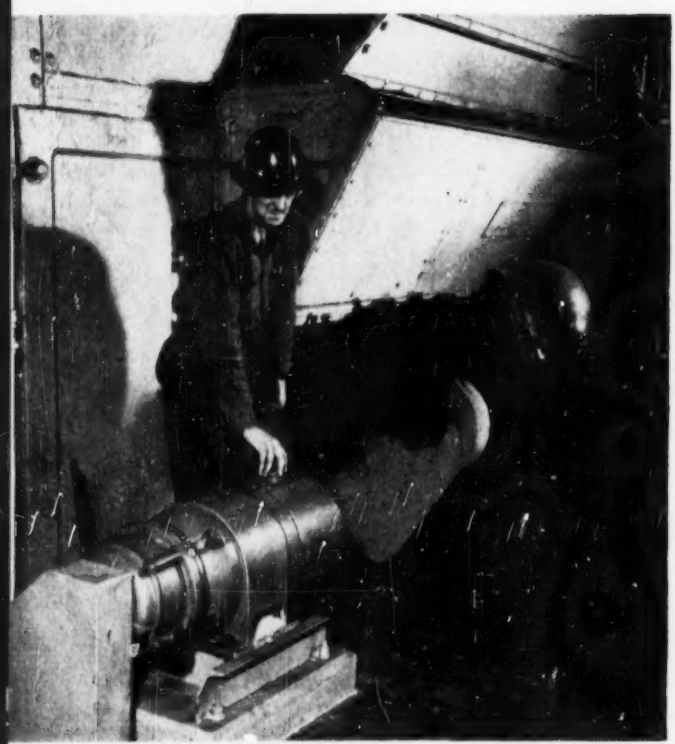
THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 66 YEARS*

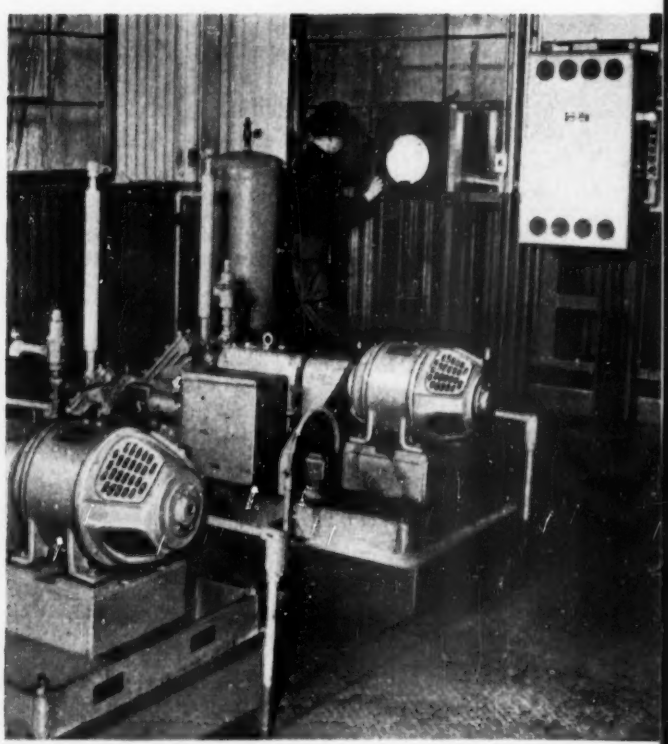


CONTROL SENSITIVITY of the G-E Speed Variator at the Jefferson Mill Inc., Jefferson, Ga., helps cut costs by enabling the operator to speed up the splicing of the cloth rolls . . . enables him to easily control processing speed for any type of cloth. The Speed Variator is a packaged unit . . . easily installed in any convenient location . . . provides your machine with stepless speed control up to a 40 to 1 ratio.

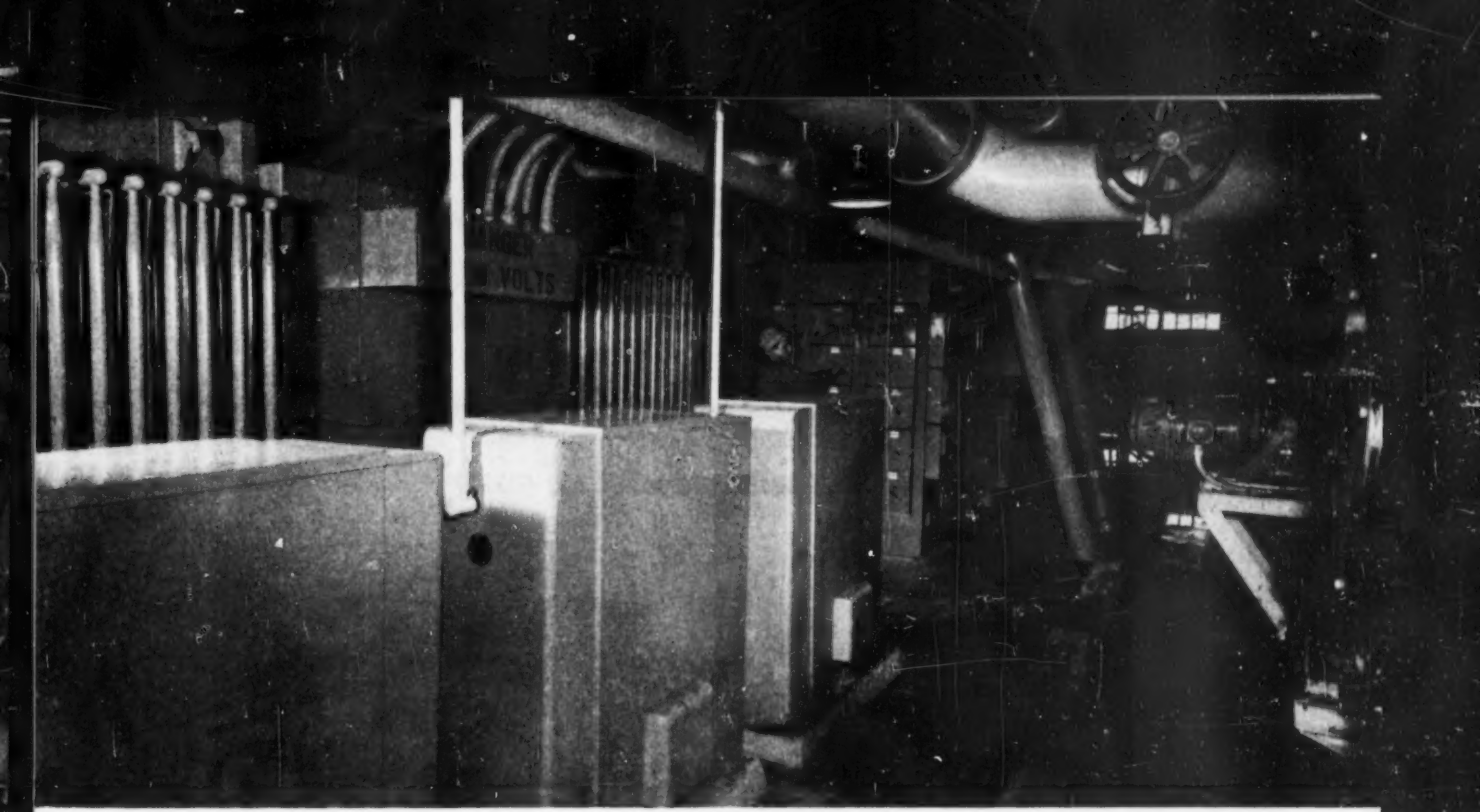
Cut Costs by modernizing your machines



G-E ACA MOTORS now control coal stokers at the Socony-Vacuum Oil Co., Inc., Olean, N. Y. Working directly from AC current the ACA motor offers low cost, low range stepless speed adjustment.



G-E THY-MO-TROL DRIVE accurately controls chemical proportioning pumps at Fibreboard Products, Inc. East Antioch, Calif. This electronic drive offers precise control in speed ranges up to 100 to 1.



G-E SPEED VARIATORS at the Ohio Boxboard Co., Rittman, Ohio, centralize control of various stock preparation processes . . . guard stock thickener speeds. Here you see three of the Speed Variator units—foreground . . . Available in ratings from 1 to 200 hp the versatile G-E Speed Variator can be adapted for even closer speed regulation by the addition of an amplidyne or electronic regulator.

with a G-E Adjustable-Speed Drive!

Here are four manufacturers who have effectively improved one or more of the manufacturing operations in their plants by modernizing their equipment with G-E Adjustable-Speed Drives.

In the same way the proper application of adjustable speed can minimize waste and increase production for you. In addition, adjustable speed by making your present equipment more flexible, will enable you to manufacture a greater variety of goods.

G-E Adjustable-Speed Drives give you economical speed regulation as close as 1% if necessary . . . assure you of correct stepless speed adjustment. Standard drives are available in ratings from 1/40 to 200 hp with speed ranges from 3 to 1 up to 100 to 1.

For full information consult your nearest General Electric Apparatus Sales Office. Your G-E Sales representative will be glad to recommend the most economical drive best suited to your operation. For printed information on the complete line of Adjustable-Speed Drives, use the coupon.

You can put your confidence in—

GENERAL ELECTRIC

LET G.E. HELP YOU PICK THE RIGHT DRIVE

Because only General Electric makes all major types of electric adjustable-speed drives, it is best qualified to help you select the right drive. Send for these informative bulletins.

☐ **A.** This 26-page manual describes **all** four types of drives and where to apply them. Bulletin GEA-5334.

☐ **B.** Lower cost, simplest a-c drive. Bulletin GEA-4883.

☐ **C.** More flexibility, moderate cost. Bulletin GEA-5335.

☐ **D.** Top performance, 1/40—30 hp. Bulletin GEA-5337.

☐ **E.** Top performance, 1–200 hp. Bulletin GEA-5336.

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Please send me the bulletins checked
☐ for reference only
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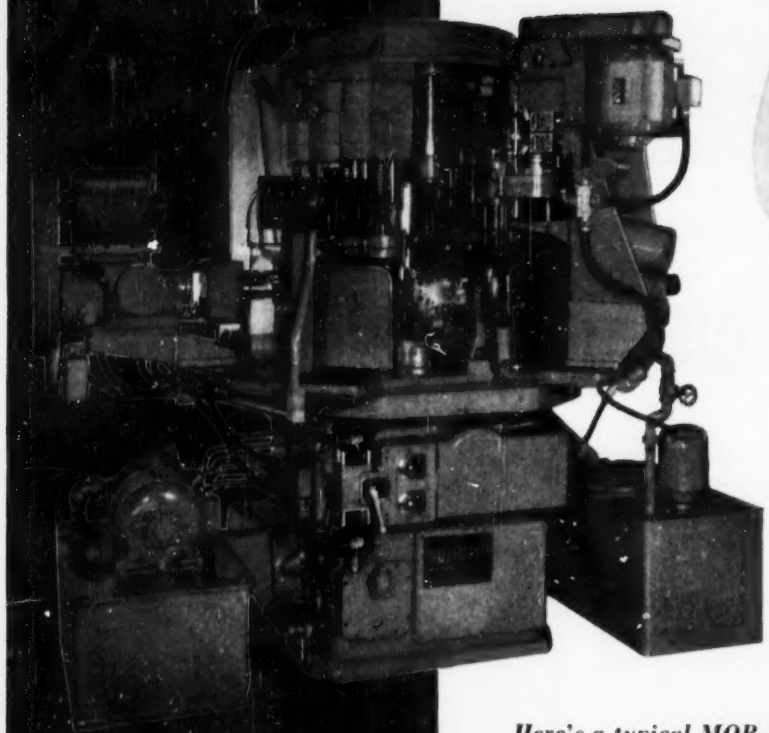
how little does it cost...

to get "special machine" production with combination standard units?



Producing 170 finished transmission control valve bodies per hour at 100% efficiency, this machine performs 32 drilling and tapping operations in two cycles.

Here's a typical MOR-SPEED answer to an ever-more important problem:

A combination of Morris standard units . . . center column, base, indexing mechanism and hydraulic units . . . plus a made-to-order vertical and auxiliary side heads . . . make up this high production machine. Cost is less, delivery faster . . . the user gets the accuracy and low cost production of a "special" without the usual sky-high costs and limited application of conventional units.

Consider the multiple savings . . . investment, labor, time and floor space . . . of MOR-SPEED multiple machining. Let Morris Engineers prove that high production *and* precision can be yours for less than you might imagine.

a better product at less cost with precision - plus production

Builders of MOR-SPEED Lines

Morris

THE MORRIS MACHINE TOOL CO.

933 HARRIET ST., CINCINNATI 3, OHIO

No. 6 in a Series

Carbides dictate the conditions

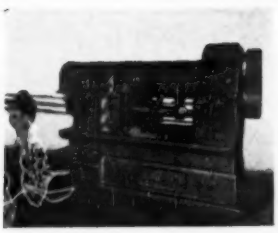
All accepted cutting tool materials have the common characteristic of specifying the conditions under which they will perform at maximum efficiency. And if the results are sufficiently promising the conditions will eventually be met.

ONE HUNDRED PERCENT carbide application on a multiple spindle bar automatic makes specific demands on both machine and personnel for successful use. The part illustrated is from regular production on comparative runs, in a plant where the conditions were met.

The Conomatic Carbide Development program can be of possible service to you in determining the suitability of your work, or any part of it, to 100% carbide tooling. Just ask your Cone Representative for details, or inquire direct.

MATERIAL — BRASS: Pickoff attachment in 6th position permits machining piece complete.

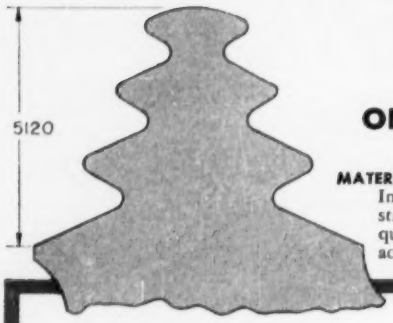
	HSS	CARBIDE
Cycle Time	12 secs.	6 secs.
Work Spindle Speed	1125 R.P.M. at 331 S.F.	1528 R.P.M. at 450 S.F.
Tool Wear	50,000 pcs. per grind	unlimited number of pieces per grind



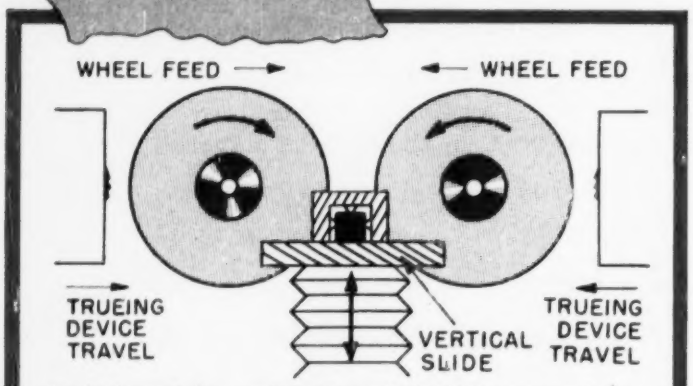
Conomatic} CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

FORM GRINDING
JET ENGINE BUCKET ROOTS
FROM THE SOLID!

ON J & L DUAL-WHEEL AUTOMATIC FORM GRINDERS



MATERIAL BORDERS ON UNMACHINABLE Intense heat and great centrifugal stresses on the pressure surfaces require the toughest material and most accurate finish.



Bucket is mounted on a reciprocating vertical slide for two-way grinding.

AUTOMATICITY SPEEDS PRODUCTION — MAINTAINS REPETITIVE ACCURACY — Operation is simplified to the push button stage by a completely automatic work cycle.

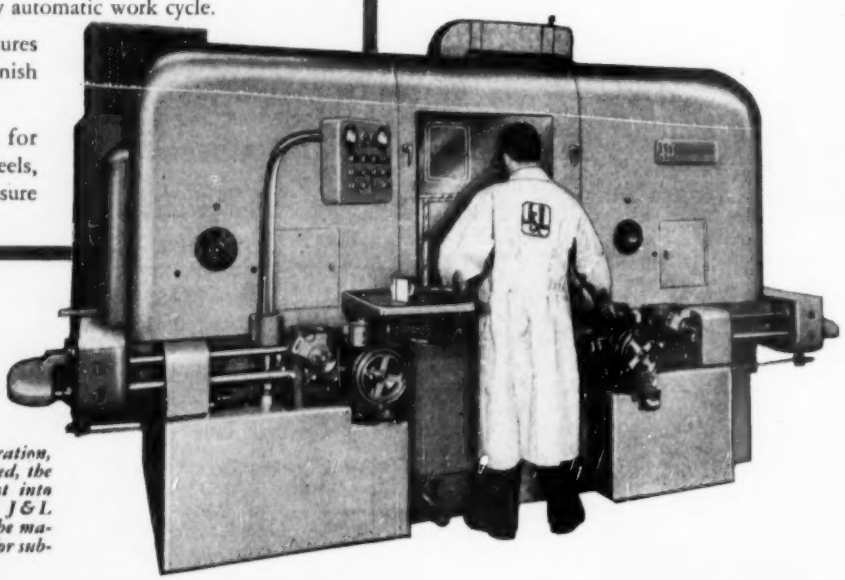
Automatic wheel trueing assures accuracy of form—includes finish trueing before final cut.

Automatic compensation for amount dressed off the wheels, and automatic wheel feed assure accurate sizing.

FEW MORE DIFFICULT GRINDING JOBS EXIST — Yet both sides of the root are ground simultaneously, to gage tolerances, on a production basis.

REPETITIVE ACCURACY MAINTAINED
Spacing of pressure surfaces within .0002
Taper within .0005
Angles within 10 minutes
Thickness from .0005 to .001

ACHIEVEMENT RESULT OF SEVERAL YEARS' RESEARCH AND EXPERIMENTATION — This application of the proven principles, long incorporated in J & L Thread Grinders, was initiated several years ago. The first machine was delivered in 1948. Continued study and subsequent refinements have helped lick one of the toughest machining problems of our day. Perhaps we can help you too.



Before the grinding operation, the foil contour is checked, the blade oriented and cast into a matrix, on a special J & L Optical Comparator. The matrix serves as a fixture for subsequent operations.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

THREAD GRINDER DIVISION

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

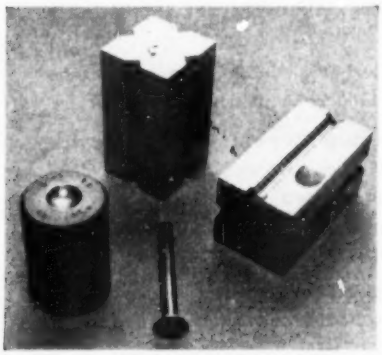
PENCIL SLIPPED . . . DIES BROKE

One of our customers reported his cold-heading dies were cracking and spalling. The spalled areas appeared to be the result of the hard case upsetting into the softer core.

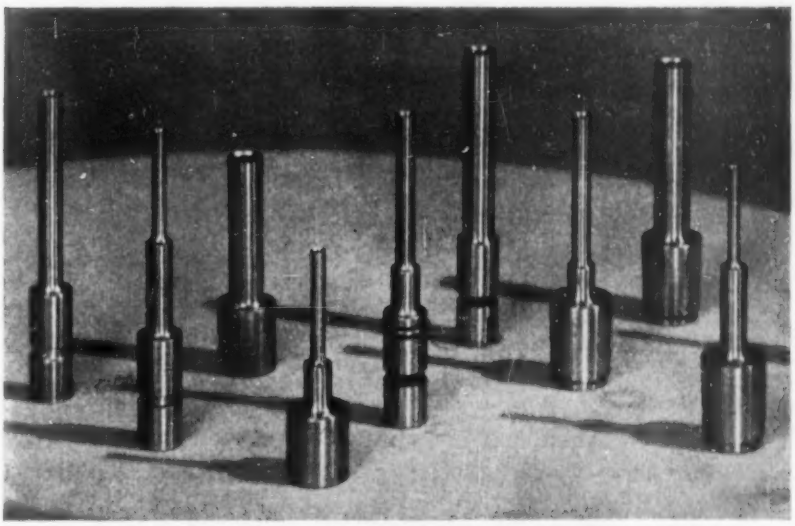
Our metallurgical contact man who visited the customer's plant couldn't find anything out of order, until he happened to read over an order the customer had entered for the steel. Then the light began to dawn.

The answer? The customer had failed to specify "cold-heading die quality" on the order. There's quite a difference between ordering "carbon tool steel" and "cold-heading die quality steel."

It's the difference between a tool steel that's processed for doing a fine job on severe cold-heading and steel that just isn't suitable for this type of special application.



The gripper and header dies shown above, made of Bethlehem XX Cold-Heading Die Steel, have the right combination of hard surface and tough core for cold-heading thousands of steel bolts each day.



"Even the roughest kind of service in binderies and printshops won't break paper drills when they're made of Omega tool steel," says William Gynther of Bent and Gynther, Portland, Ore.

OMEGA HELPS TO STOP BREAKAGE OF PAPER DRILLS

Drilling holes through paper may sound easy, but it isn't. Printers who do much paper-drilling will tell you that the drills often break and bend.

The other day we were given quite a fill-in on the subject by William Gynther, one of the owners of Bent and Gynther, Portland, Ore., suppliers of drills to the printing trade. Mr. Gynther told how he once noticed four broken drills on the desk of a prospective buyer. He made a wager that *his* drills wouldn't break, even though this printshop apparently gave the drills pretty severe treatment. The printer took him up—and hasn't broken a drill in some years.

The success of the "B and G" drills is attributed by Mr. Gynther to the unique taper inside the drill and to the grade of tool steel (Bethlehem's Omega). Omega is our silico-manganese grade of shock-resisting steel, and while it is intended mainly for cold-battering tools where terrific shock must be absorbed, it appears to have the ideal hardening properties for these paper drills, together with plenty of the toughness required to withstand stress and strain.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

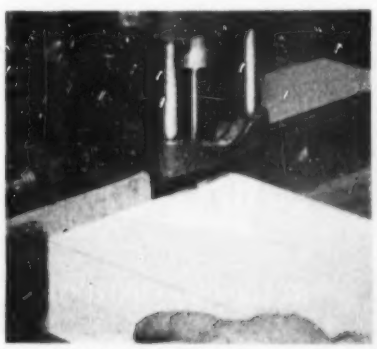
Always temper immediately after hardening

It's always risky to delay or to omit tempering immediately after a hardened tool cools following the quench. With a liquid-quenched steel always get the tool into the tempering furnace as soon as it cools down to about 150 to 200 F; an air-hardening steel should cool to 150 F.

Some heat-treaters spit on a tool—if there's no sizzle, it's cool enough to temper. You can also use a contact pyrometer or other indicators to get a more accurate check on the temperature of freshly quenched tools.

If you delay the temper—to check hardness or for some other reason—you're running the risk of permitting stresses to build up. And these stresses may crack the tool in half, even before it reaches the tempering furnace. Of course, such failures don't always occur if this precaution is ignored.

Some people just can't be convinced that it's risky to delay tempering after the tool cools following the quench. But there's no way to predict just when it may happen, so why take the risk?



Boring holes through a stack of paper doesn't sound like a tough job, but there's a lot of stress on these hollow drills which causes frequent breakage—unless they're made of the right steel.

HELP WANTED

Manufacturing plant needs précision surface grinder capable of high speed for increased production. Qualifications must include: accuracy, flexibility of operation, easy and low-cost maintenance plus durability and long life. References of past experience must be furnished.

here's your answer

Covel Surface Grinders are fully qualified to meet these requirements and are ready to start working for you NOW. Covel has built precision grinders since 1874. Our thousands of satisfied users are your assurance of dependable service and top performance.

QUALIFYING FEATURES

Hydraulic Feed—low-pressure hydraulic system used throughout. Pilot valve gives smooth reversal at high speed. Table speed from 10 to 90 ft. per minute.

Sealed-for-life Spindle requires no lubrication—keeps out grit.

Grinding Wheel Truing Device mounted on vertical slide. Enables wheel to be dressed without removing work from chuck on production grinding. Saves valuable time.

Anti-Friction Ball or Roller Bearings used throughout.

Hard chrome table ways for extra long life.

Hardened and ground cross feed and elevating screws.

TWO SIZES:	No. 20	No. 35
Work capacity	6" x 18"	8" x 24"
Transverse table travel	6¾"	9"
Longitudinal table travel	20"	27"
Grinding wheel size	10"	12"
Capacity under wheel	12"	11"

Write for BULLETIN AM-93

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

DRILL GRINDERS • UNIVERSAL CUTTERS & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS

Ask your Distributor

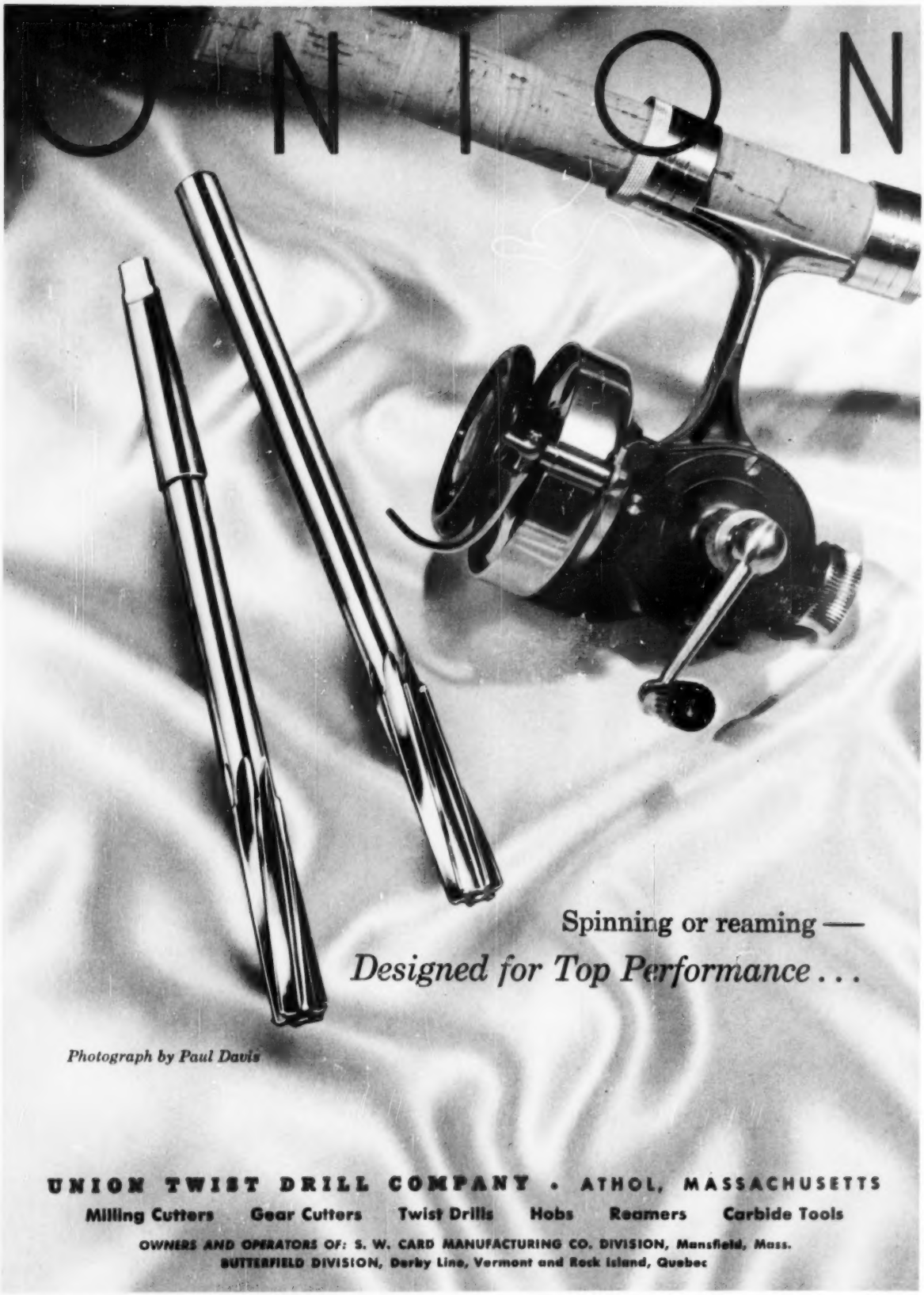
Photograph by Paul Davis

Part of Butterfield's fine reputation for taps and dies stems from rigid control over quality production. The value shows up in performance.

B U T T E R F I E L D

Union Twist Drill Company ***Butterfield Division*** *Derby Line, Vermont, U. S. A.*

TAPS • DIES • REAMERS • DRILLS • COUNTERBORES • SCREW PLATES

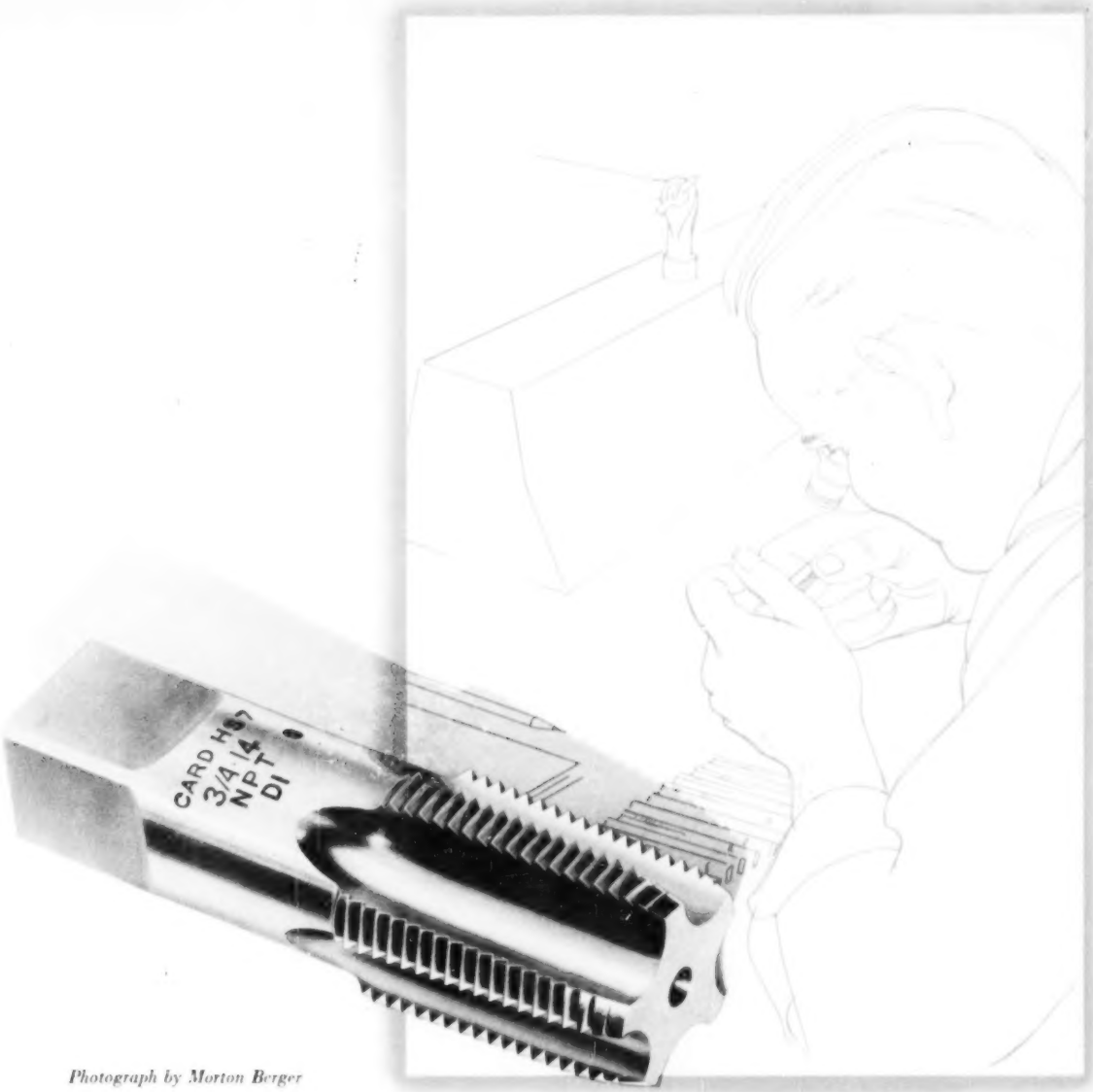


UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

CUT INVENTORY COSTS—ORDER FROM YOUR LOCAL UNION DISTRIBUTOR



Photograph by Morton Berger

TAPS *by* CARD

The quality is greater than the price. **When you specify Card Taps you get far more than fine steel expertly engineered. You get the benefit of an accumulation of experience in tap making that dates back 79 years.**

Completely stocked offices at Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco and Seattle.

See your local Card distributor for prompt deliveries and helpful service

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO. The CARD Quality **TAPS • DIES • SCREW PLATES**

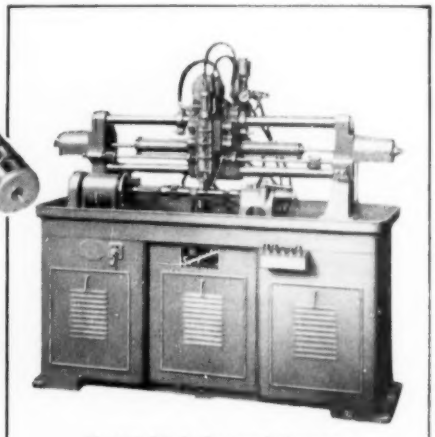
SUPERFINISH
MAKES THESE PARTS BETTER
. . . 5 WAYS!

You're looking at a group of parts that go into the Gisholt Fastermatic Automatic Turret Lathe. Super-smoothness of working surfaces of these parts is vital to the precision and long life of the machine. So all these parts are Superfinished—including overhead pilot bars, piston rods, hydraulic control valves, thrust collars, turret locating pins and rollers.

The benefits are many:

1. Superfinishing removes all chatter marks, grinder flats, "smear metal" and other surface irregularities.
2. It assures more nearly perfect geometrical forms. This means more uniform bearing surfaces. They therefore last far longer.
3. Superfinishing simplifies assembly because the surfaces are down to true "base metal"...and no break-in tolerances are required.
4. Superfinishing simplifies grinding and reduces spoilage.
5. The greater degree of smoothness makes the parts easier operating, reduces wear.

The net result of Superfinish here—as it can be in your case—is parts that perform better, last longer and cost far less in the long run. See how Superfinish can solve your problems of both wear and surface roughness. Get your copy of "Wear and Surface Finish," and complete textbook covering all phases of Superfinish.



Model 52-A General-Purpose Superfinisher

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

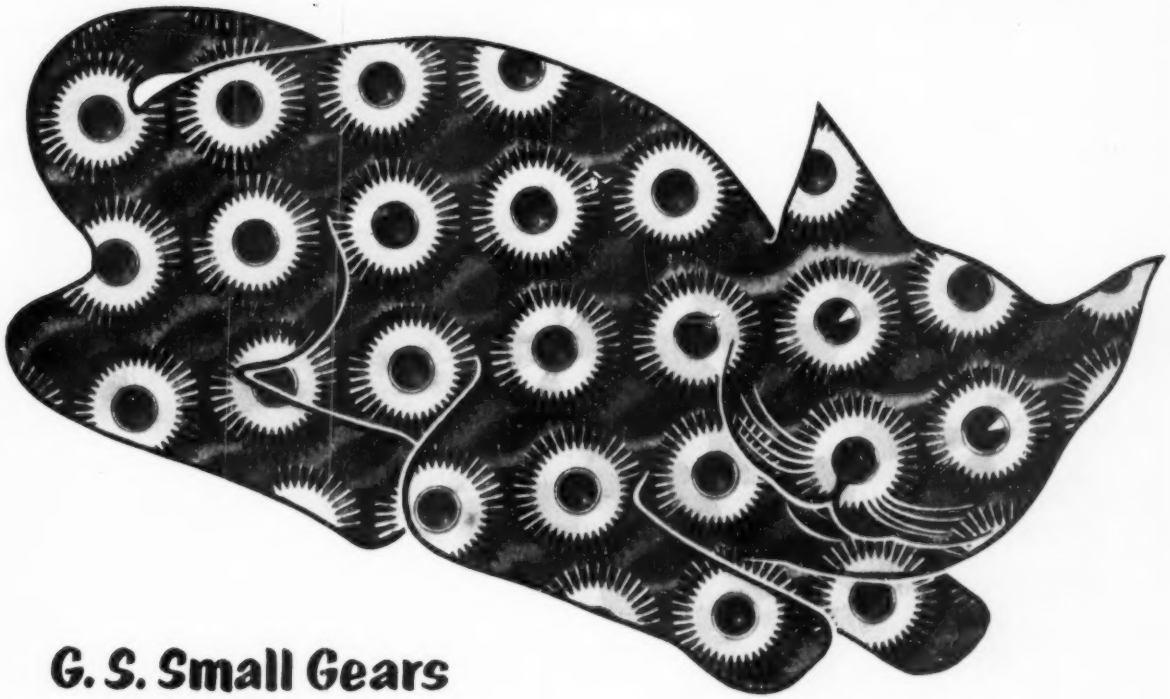
GISHOLT

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

GET OUR *Free* 6-PAGE FOLDER

See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. This attractively printed 8½ x 11" 6-page folder is punched for ring-binder use. You'll want to keep it handy for frequent reference. It contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!



G. S. Small Gears

PUR-R-R Like a Kitten!

Smooth, quiet, *"purring"* performance is characteristic of the Fractional Horsepower Gearing we make! And no matter *what* the device or *how* the power is transmitted, you can depend upon these better Small Gears to give greater satisfaction and longer life to the product. G. S. have the distinction of over 30 years experience in the design and manufacture of Fractional Horsepower Gearing *exclusively!* Methods and machines have been perfected to a degree of efficiency and economy often considered impossible! Each Gear, in a production run of *thousands,* is precision produced to remarkable standards of accuracy and UNIFORMITY. You too can profit from the *consistently* finer quality of G. S. Gearing. Decide *now,* to let our skilled engineers and production craftsmen help you. Will you phone or write us today?

FRACTIONAL HORSEPOWER

GS

GEAR

Specialties, Inc.

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CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS
OF FRACTIONAL HORSEPOWER GEARING

You get more parts per hour

PRODUCTION INCREASED 50%
COSTS REDUCED 11.6%

MACHINE TEST REPORT

Stock Size	-5/8" Hexagon
Part Name	-Hose End Blank
Machine	-1-1/4 RAC Acme Gridley
Machine Operations	-Forming, drilling, reaming
End Tool Slide Cam	-1-2
End Tool Slide Feed	- .0065 for B-1113 - .0075 for MX

COMPARATIVE PRODUCTION

GRADE	RPM	SFM	PART TIME (SECONDS)	GROSS PARTS PER HOUR	PRODUCTION INCREASE (PERCENT)	TOOL LIFE INCREASE (PERCENT)
B-1113	1166	221	6	600	-	-
MX	1536	290	4	900	50	50

*ESTIMATE OF COMPARATIVE COSTS

	B-1113	MX
Net Production/Hr. at 70% Efficiency	420	630
Hours to make 10,000 parts	23.81	15.87
Direct Labor	$ 22.02	$ 14.68
Machine Overhead @ $2.275 per Mach./Hr.	$ 54.17	$ 36.10
Conversion Cost	$ 76.19	$ 50.78
Material Cost	$142.30	$145.32
Total Manufactured Cost of 10,000 parts	$218.49	$195.08
Saving	$ 23.41	or 11.6%

*Note—These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop.

PRODUCTION INCREASED 51.6%
COSTS REDUCED 17.3%

MACHINE TEST REPORT

Stock Size	-1-1.8" Rd
Part Name	-Pulley Hub
Machine	-6 Spindle Conosatic, 1-1/4"
Machine Operations	-Rough form, finish form, drill, ream, counter-sink, spin, cut-off

COMPARATIVE PRODUCTION

GRADE	PART TIME (SECONDS)†	GROSS PARTS PER HOUR	PRODUCTION INCREASE (PERCENT)	TOOL LIFE INCREASE (PERCENT)
B-1113	22.9	157	-	-
MX	15.1	238	51.6	51.6

†Estimated

*ESTIMATE OF COMPARATIVE COSTS

	B-1113	MX
Net Production/Hr. at 70% Efficiency	110	167
Hours to make 10,000 parts	90.9	60.0
Direct Labor	$ 84.08	$ 55.50
Machine Overhead @ $2.275 per Mach. Hr.	$206.80	$136.50
Conversion Cost	$290.88	$192.00
Material Cost	$240.00	$280.00
Total Manufactured Cost of 10,000 parts	$530.88	$472.00
Saving	$ 98.88	or 17.3%

*Note—These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop.

PRODUCTION INCREASED 29%
COSTS REDUCED 8.0%

MACHINE TEST REPORT

Stock Size	-3/4" Hexagon
Part Name	-Master Cylinder Outlet
Machine	-1-1/4 RAC Acme Gridley
Machine Operations	-Forming, drilling, threading, shaving, turning, cut-off
End Tool Slide Cam	-5-8
End Tool Slide Feed	- .0068 for B-1113 - .0073 for MX

COMPARATIVE PRODUCTION

GRADE	RPM	SFM†	PART TIME (SECONDS)	GROSS PARTS PER HOUR	PRODUCTION INCREASE (PERCENT)	TOOL LIFE INCREASE (PERCENT)
B-1113	942	213	7-3.4	465	-	-
MX	1215	275	6	600	29	29

†Calculated from diameter across corners

*ESTIMATE OF COMPARATIVE COSTS

	B-1113	MX
Net Production/Hr. at 70% Efficiency	306	420
Hours to make 10,000 parts	32.68	23.81
Direct Labor	$ 29.36	$ 22.02
Machine Overhead @ $2.275 per Mach./Hr.	$ 69.80	$ 54.17
Conversion Cost	$ 99.16	$ 76.19
Material Cost	$175.50	$175.50
Total Manufactured Cost of 10,000 parts	$273.68	$251.69
Saving	$ 21.99	or 8.0%

*Note—These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop.

at lower cost per part ...when you do the job with MX

today's faster-cutting screw stock

● You don't have to take our word for it. When we tell you that U·S·S Free-Machining MX will increase your production and that it will cut the cost of any part you now machine from ordinary Bessemer screw stock, we have the FACTS to back us up . . . figures that speak for themselves.

In the three years that this high speed, freer-cutting bar stock has been on the market, hundreds of shops have put it to the test. Although the more than a billion parts made with MX have been of infinite variety and have been produced under dissimilar conditions and on screw machine equipment of different types—the results obtained have been similar.

Here is what has happened in shop after shop: Output per machine, per hour, per man, has been increased. Time between tool grindings has been extended. Parts finish has been better. Close dimensional accuracy has been easier to obtain. Rejections have been fewer.

And despite its better performance, MX costs no more than ordinary screw stock. Consequently, savings with MX have been invariably recorded. These savings have averaged between 10 and 15%, but also have run as high as 42%. Can you afford to give your competition this edge on you?

Give U·S·S Free-Machining MX a thorough trial. Produced in all the popular screw stock sizes, it is sold in cold-finished form by your regular supplier either as "MX" or under his own identifying trade name. In hot-rolled form MX is available direct through our nearest district sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

3-495

UNITED STATES STEEL

"Specific" TAPS CUT YOUR TAPPING COSTS

1. If you use taps in just one kind of material .... **Then order 'DETROIT' Specific taps for that material.**
2. If taps are used mostly for a specific material but also occasionally for other materials .... **Then order 'DETROIT' Specific taps for that specific material. They do a good job on other materials, too.**
3. If you use taps interchangeably for different materials .... **Then order 'DETROIT' general-purpose taps.**

Every 'DETROIT' Specific tap is clearly marked on the shank with the name of the specific material for which it is ideally suited. Ask for Catalog-Bulletin #ST-52.

DETROIT TAP & TOOL CO.

8615 E. EIGHT MILE RD. BASELINE, MICHIGAN

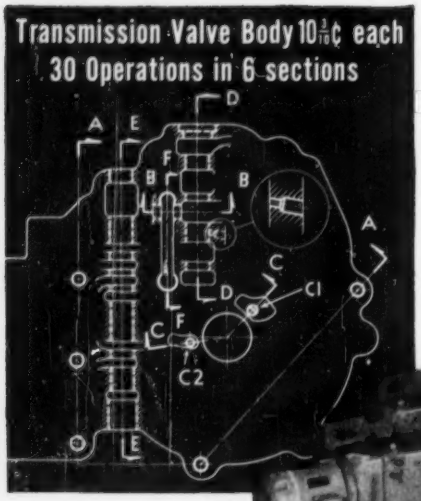
production PLUS

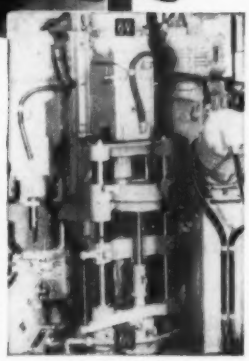
The COPYMATIC Tracer-Controlled Lathe proves that accuracy at production rates *is* possible and profitable. In unanimous reports, owners state their Lodge and Shipley COPYMATICS save up to 87%, pay for themselves in a year or two! Write for NEW Catalog No. 216. *The Lodge & Shipley Company, 3055 Colerain Avenue, Cincinnati 25, Ohio*

Lodge & Shipley

....your **LODGE**-*ical choice!*

Kingsbury give you

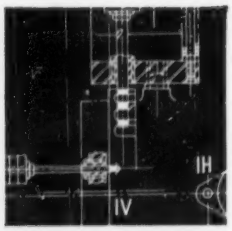


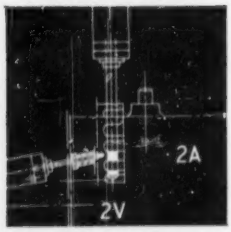


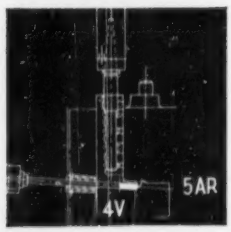
This Kingsbury central column machine has knees for mounting 3 Horizontal (H) Units and 8 Angle (A) Units. The central column mounts 11 Vertical (V) Units, one of which has two heads, one above the work and the other under it (U). Some of the units have multiple spindles. The 60-inch index table has 12 stations — one for loading and unloading.

The machine performs 30 operations: drilling, c'boring and reaming. Some of these are illustrated below.

This Kingsbury produces 176 pieces per hour gross at an average cost of 10.26¢ per piece.





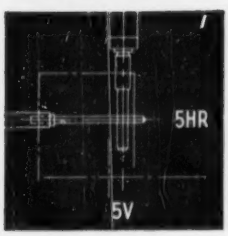


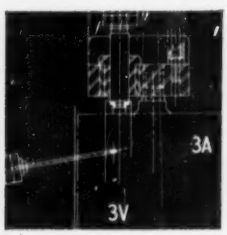
Follow this Transmission Valve Body

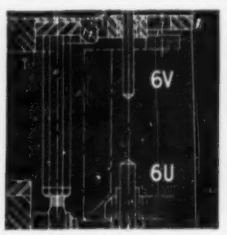
Section A: Unit 1H .281 drill — 5 thru-holes.

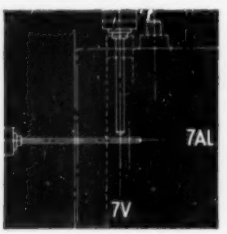
Section DD: Five vertical and three angle units prepare this long valve hole thru five walls. It must be straight, accurate, parallel with Section EE, and finished ready for borizing. Unit 1V .437 drills thru three walls; Unit 2V .437 drills thru the fifth wall. Units 4V and 5V rough- and semi-finish step-ream the hole. Unit 3V step-c'bores .812 and .640 at entrance to hole.

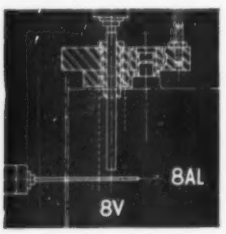
Angle units finish the port at the fourth wall. Unit 2A .156 drills $\frac{15}{64}$ deep; Unit 3A .096 drills thru and Unit 10A .1115 reams this hole.











Special Purpose Machines are custom-built to high production at low cost

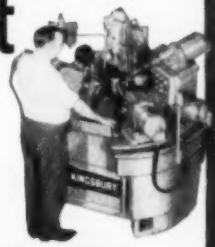
Units of 1/2 to 5 hp drill, ream, c'bore, mill, tap, thread — all accurately and economically

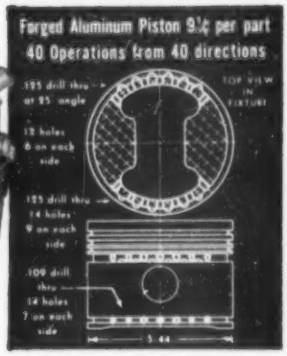
Operations are combined to insure accuracy, speed production, save money. The piece is chucked only once. It travels through the machine cycle, stopping successively at stations where Kingsbury Units complete their operations within predetermined time limits. At some stations several units work on the piece simultaneously. The operator loads and unloads the machine — there is no rehandling. Accurate machining reduces scrap. And think of the floor space saved!

If you have a suitable piece which requires a combination of these machining operations, it will pay you to investigate a Kingsbury. We can tell you whether or not we could develop a machine to make the piece in quantity at satisfactory cost. In fact, we would not tackle the job unless we could!

Kingsbury Machine Tool Corp.
102 Laurel Street, Keene, New Hampshire

KINGSBURY
AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production





Forged Aluminum Piston
60 Pieces per Hour Gross — 9-9/10¢ per Piece

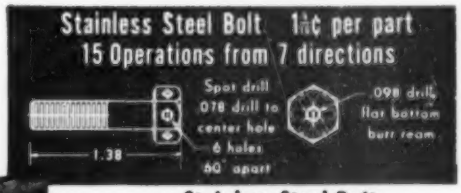
This compact machine has a 60-inch base with 6 units mounted around a central work fixture. Operator loads the part, trips a valve and watches the machine go through an automatic cycle that takes 41 seconds.

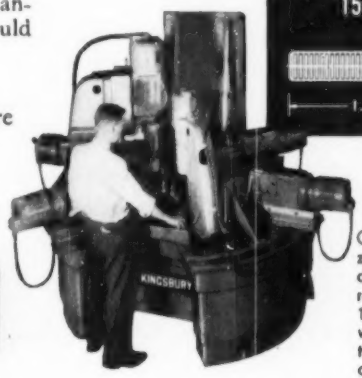
The piston indexes on its own axis. First index 26° 15', then 5 indexes of 14° each to complete 12 angular holes in upper ring groove. Heads 1A & 4A do this work.

Next index 16° then 1 index of 18° and 5 indexes of 14° complete 14 horizontal holes in lower ring groove. Heads 3H & 6H do this work.

Next index 43° 30', then 6 indexes of 15° to complete 14 horizontal holes in upper ring groove. Heads 2H & 5H do this work.

Now index 26° 15' to bring work to loading position. Machine stops automatically, job is finished.


Stainless Steel Bolt 1¾¢ per part
15 Operations from 7 directions
Spot drill
.078 drill to center hole
6 holes 60° apart
1.38
.098 drill, flat bottom burr ream



Stainless Steel Bolt
460 Pieces per Hour Gross — 1-9/10¢ per Piece

On an 80-inch diameter base, four horizontal and two vertical units spot drill, drill thru, flat-bottom and burr-ream as required. The 12-inch index table has 12 work fixtures, and each rotates clockwise. Work fixtures rotate 90° when the table indexes 30°. Bushing carriers insure accuracy.

through 30 operations — with only one chucking

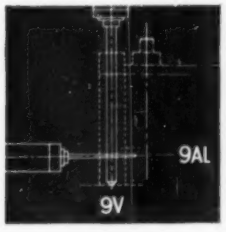
Section EE is another long valve hole thru nine walls, prepared for borizing. Vertical units perform 7 operations.

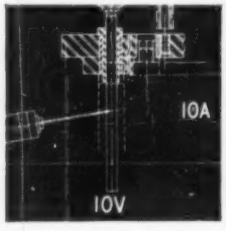
Unit 6V .422 undersize drills down thru two walls. Unit 6U .625 drills up thru ninth wall. Unit 7V .421 drills down thru three more walls. Unit 8V .4531 end-reams the hole thru five walls. Unit 9V .453 drills the hole thru. Units 10V and 11V .4687 rough end-ream and .4882 semi-finish ream the hole.

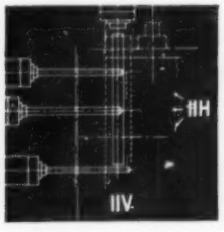
Section FF: Unit at 11H drills .343 dia. and .281 dia. partial holes shown; and four .281 dia. holes not shown.

Section BB: Unit 5H Right .312 drill thru both walls.

Section CC: Unit 5A Right .218 drills hole C1 full depth. Four Units operate on step-hole at C2; Unit 5A Left .060/.065 drills thru; Unit 7A Left .156 drills 17/32 deep; Unit 8A Left .094 drill undersize, and Unit 9A Left .094/.096 reams the hole.







Each Unit Cost on the drawings
includes the cost of the man and of the machine — no power or overhead. We assumed:
Unit cost of man equal to:
$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross} \times 80\% \text{ efficiency}}$$
Unit cost of machine to be:
$$\frac{\text{price of tooled machine}}{\text{output in 4000 hrs. @ 80\% efficiency}}$$

NO GETTING AROUND IT!

A De Laval Oil Purifier Safeguards Production and Salvages the Oil

Purification of cutting oil or other factory oils by De Laval Centrifugal Oil Purifiers is both a salvage and a maintenance operation. The value of being able to re-use purified oil instead of throwing used oil away is obvious. Even more important than the salvage value of the oil, however, are the actual production advantages of having a plentiful supply of oil maintained absolutely free of metallic impurities.

When the oil is cutting oil, the production advantages of De Laval purification include longer tool life—higher permissible cutting speeds—minimized wear on moving parts of machine tools. If the oil is test oil, the tests themselves are more reliable when the oil is kept dry and clean by centrifugal force.

These are only two of the many types of factory oils that yield both salvage and maintenance savings when purified by De Laval machines.

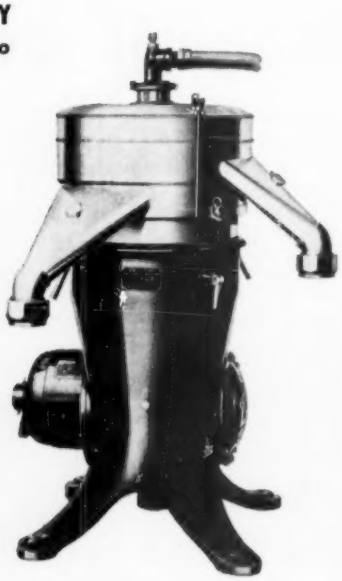
Bulletin MM-1 gives many other examples. Write for your copy.

THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

You save more than the oil when you purify with ....

De Laval

PURIFIERS AND CLARIFIERS FOR FACTORY OILS



Cut Costs and Increase Efficiency with

HELLER

PRODUCTION MILLING MACHINES

HELLER knee type milling machines are available in either horizontal or vertical construction for use with carbide cutters for heavy milling work.

They are rigidly built for the heaviest production milling with powerful drive units with 18 speeds to a roller bearinged spindle.

The control is through push button selection and machines can be furnished standard or equipped with full automatic cycling control or with copy milling control through electro-hydraulic feeler.

Importing Heller Machines Since 1926

HELLER MACHINE CO., 114 Liberty St., New York 6, N. Y.

Takes on all comers!

This 42-72-84 Blanchard Surface Grinder is used for machining many sizes of torch cut steel plates. As the first operation after cutting, Blanchard grinding removes the proper depth of stock as required, frequently up to ⅛" per side, producing surfaces accurately flat and parallel for laying out or further machining. Work up to 7 feet across corners is regularly ground on this machine. In spite of its size, this grinder is as easily controlled as the smaller Blanchard grinders.

Typical of work produced is the 48" x 48" x 10" machine steel, die mounting plate, at left. 58 cu. in. of stock (.025" per side) is ground off in one hour and 35 minutes, floor to floor, with flatness held to .001". Note the magnetic hoist —a good tip for loading and unloading the Blanchard quickly.

Regardless of your requirements for stock removal, tolerances or surface finish, Blanchard has the grinder and grinding wheel to do each job best.

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

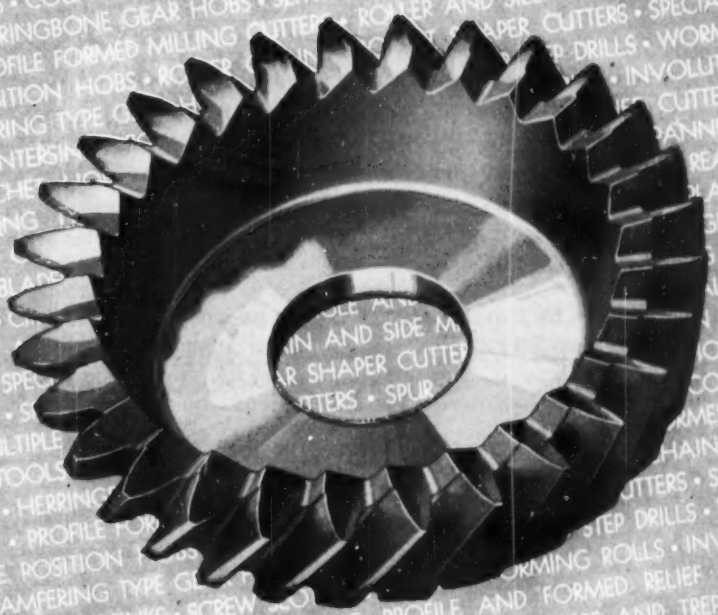
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

FOR THOSE TOUGH *Special* JOBS

...DEPEND ON

National Tool Co.



● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

NOW
more sizes of...
Stainless Socket Cap and Set Screws
Available in stock from your Allen o Distributor

Demand for rust and corrosion resistant socket screws of high finish 18-8 stainless steel has been increasing steadily for ten years.

Allens have become the leading make because of the inherent advantages of Allen manufacturing methods, and because Allen Distributors carry the widest range of sizes as standard stock items – saving their customers time and money.

Now Allen widens its margin of leadership with still more distributor-stocked standard sizes in stainless:

97 Standard Sizes in Stainless Steel Socket Cap Screws

#4 x ¼" to ⅝" x 3" with NC threads
#10 x ⅜" to ⅜" x 1½" with NF threads

54 Standard Sizes in Stainless Steel Socket Set Screws

#4 x ⅛" to ½" x 1" with NC threads
#10 in lengths from 3/16" to ¾" with NF threads

ALLEN
MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.

NEW
Grip-head Stainless Steel cap screws for more convenient handling and easy, time-saving starting.

Sold only through leading industrial distributors

92 hrs. of heat treatment

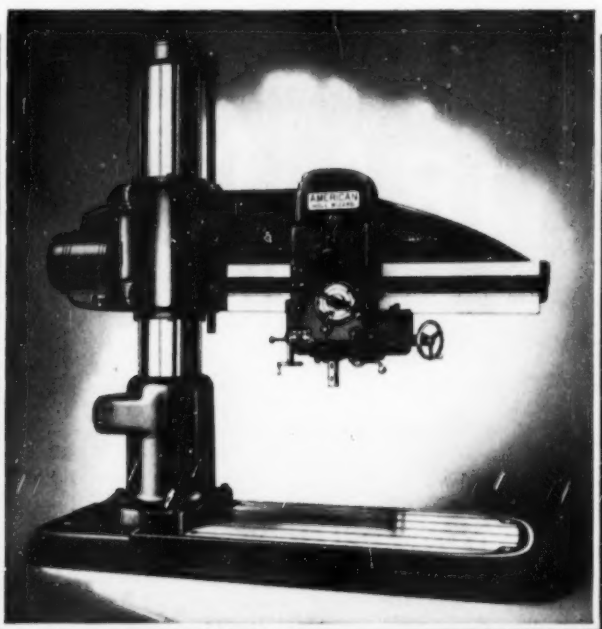
. . . required to produce the ultimate in radial drill spindles

"AMERICAN" Radial Drill Spindles are made of nitralloy. 20 hours of heat treatment from rough to finish, then 72 hours of nitriding are required to produce the wear-resistant spindles used in these radials.

Both the spindles and sleeves are nitrided to 110 degrees scleroscope. This is harder than some grades of cemented carbide. The sleeve is finish honed and the spindle ground and then diamond lapped to a sliding fit in the sleeve. Because of the lack of affinity between these two hard surfaces the clearance between them may be reduced to the very minimum, which in this case is .00025".

This results in the greatest possible stability, resulting in an ideal construction especially for accurate boring operations, which demand a high degree of smoothness and rigidity of the spindle.

This is but one of the super features that make the "AMERICAN" Hole Wizard an outstanding investment.



THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

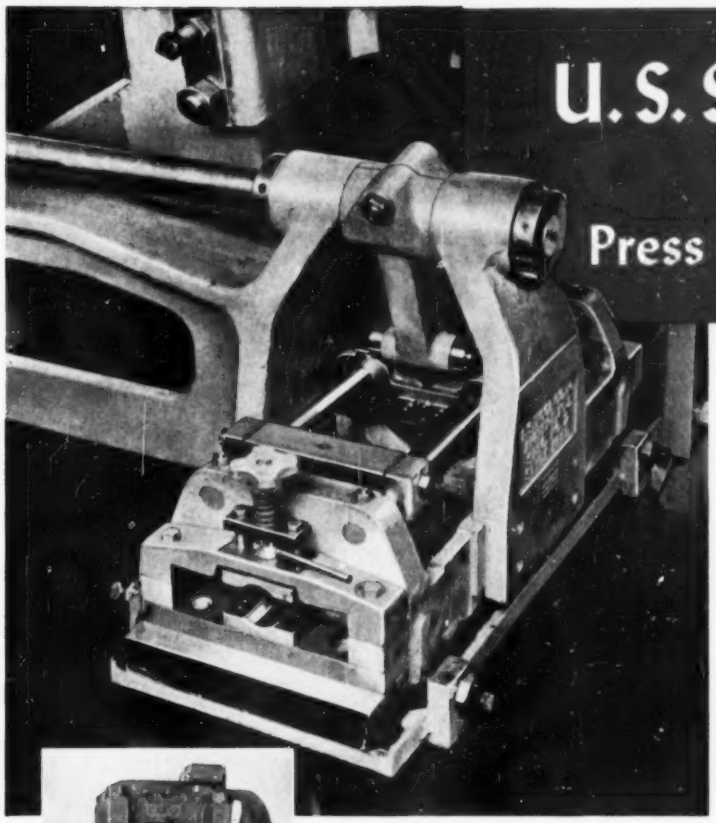
"Indispensable for Tool Rooms

and for Production Departments

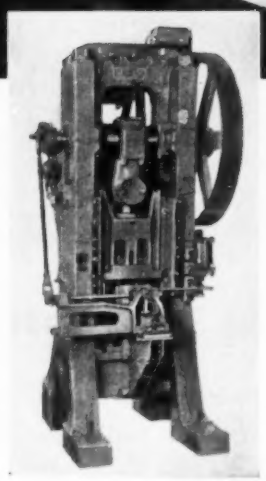
when

Extreme Accuracy is required"

LATHES • MILLING MACHINES • CHUCKING MACHINES • SECOND OPERATION MACHINES



U.S. Slide Feeds
Solve Your Press Room Problems



The close-up above shows U.S. Slide Feed, arranged to accommodate 1⅜" diameter bar stock, mounted on press manufactured by the Cleveland Punch and Shear Works Co. The illustration at the left shows the complete press with U.S. Slide feed and driving connections as installed in the plant of The Metal Specialty Co., Cincinnati, Ohio.

For Example . . . The Cleveland Punch and Shear Works Co., Cleveland, Ohio, received an order from The Metal Specialty Company, Cincinnati, Ohio, to furnish a number of their presses equipped with automatic feeds to feed 1⅜" diameter bar stock into the press for a cut-off operation. Because of the nature of the job and the accuracy required, it was decided to use U. S. Slide Feeds.

Accuracy . . . With the set-up above described, the accuracy of feed length must be such that the weight of the cut-off pieces be within closely controlled limits. The U. S. Slide Feed advances the 1⅜" diameter bar stock into the die ¾" at each stroke of the press, and the weight of the cut-off pieces varies less than 1 gram. With the U. S. Slide Feed the travel of the feed block is constrained between positive stops, thus assuring controlled accuracy.

Versatility . . . U. S. Slide Feeds are known for their accuracy in the feeding of flat stock from coils, but as described above, they can be used with equally satisfactory results for feeding round wire, bars, and stock of irregular cross section. Also, in addition to metals, U. S. Slide Feeds can be used for the feeding of materials such as paper, plastic, mica, etc.

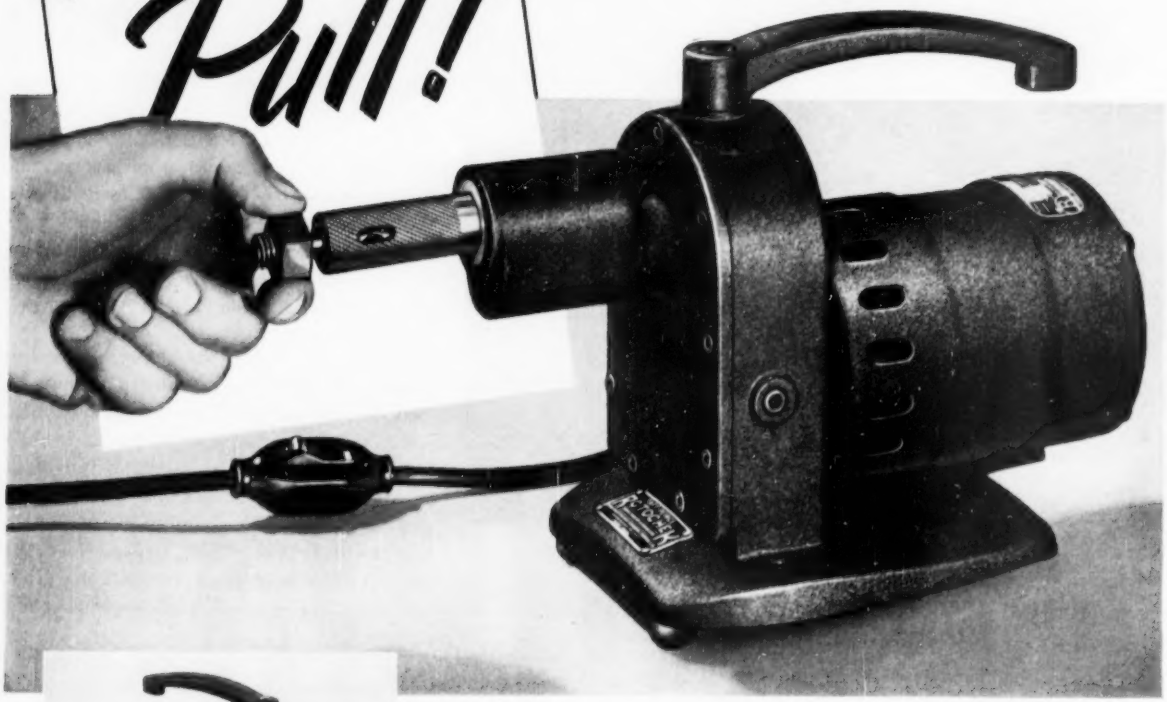
If you have a press feed problem, ask for a copy of Bulletin 80M on U. S. Automatic Press Room Equipment, which contains illustrations and descriptions of U. S. Slide Feeds, Straighteners, Stock Reels, Coil Cradles, Stock Oilers, Scrap Shoppers, etc.

US PRODUCTS

U.S. TOOL COMPANY, Inc.
AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Motion U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

Push! Pull! ...and the thread is inspected



Taft-Peirce Rotocheck* Gages 3 times faster

Here's the fastest thread gaging method yet devised. Bring the Rotocheck to the part, or the part to the Rotocheck — a slight push and the gage screws into the work. Release the pressure and the gage stops. Pull — and it disengages.

It's fast . . . accurate . . . easy to use. Operators report from 3 to 4 times as many parts inspected daily.

Available in bench model, or with handle and flexible shaft. Adaptors permit use of reversible thread members and ring gages.

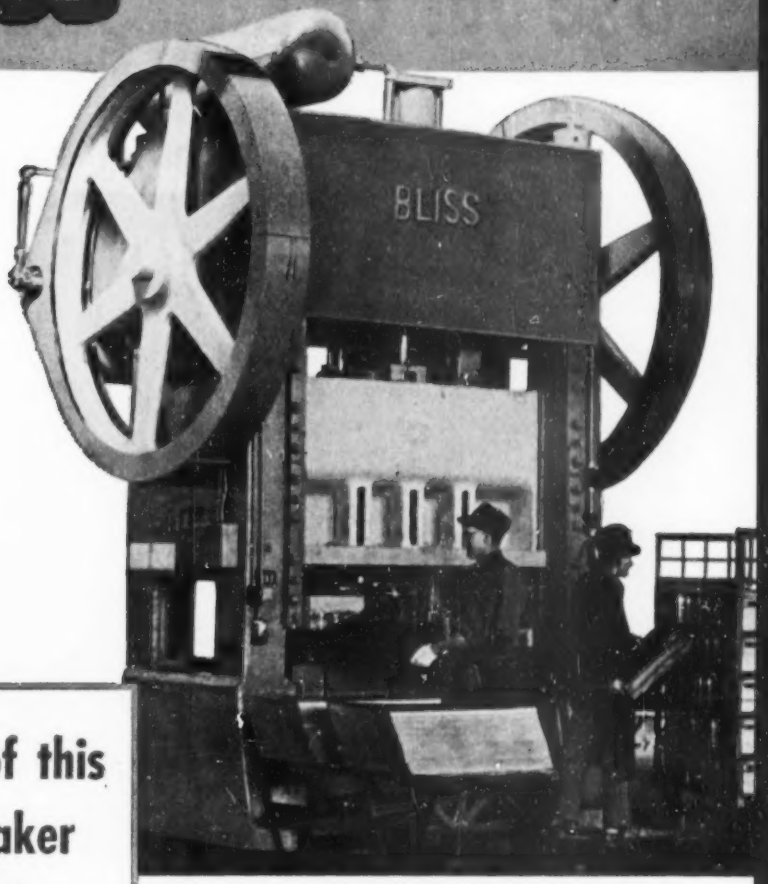
It will pay you to write for full facts today.

*Registered U. S. Patent Office

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.

T-P means Top Precision

The trend is to more stampings WITH BLISS PRESSES...



95% of presses of this leading desk maker are Bliss-Built!

NEW 250-TON PRESS is typical of modern Bliss installations at Corry-Jamestown Mfg. Corp. This straight-side press features a sturdy box-frame construction and extra-long slide adjustment.

When it comes to making steel office desks and files, Corry-Jamestown Mfg. Corp., Corry, Pa., is an acknowledged leader. And when it comes to choosing press equipment, Corry naturally turns to the leader in the press field—Bliss.

Throughout Corry-Jamestown's three plants, *95%* of the presses are *Bliss-Built*. And in its newest plant, *100%* of the presses over 10-ton capacity are *Bliss-Built*.

Rugged Bliss Straight-Side and Inclinable Presses have helped Corry maintain high quality, speed production, and minimize costs of stampings for its "STEEL AGE" desks and files.

Your local Bliss sales engineer—the trained representative of the world's largest press builder—can show you why Bliss belongs in *your* press room. Remember, Bliss can supply the right press for a given job or a complete press room.

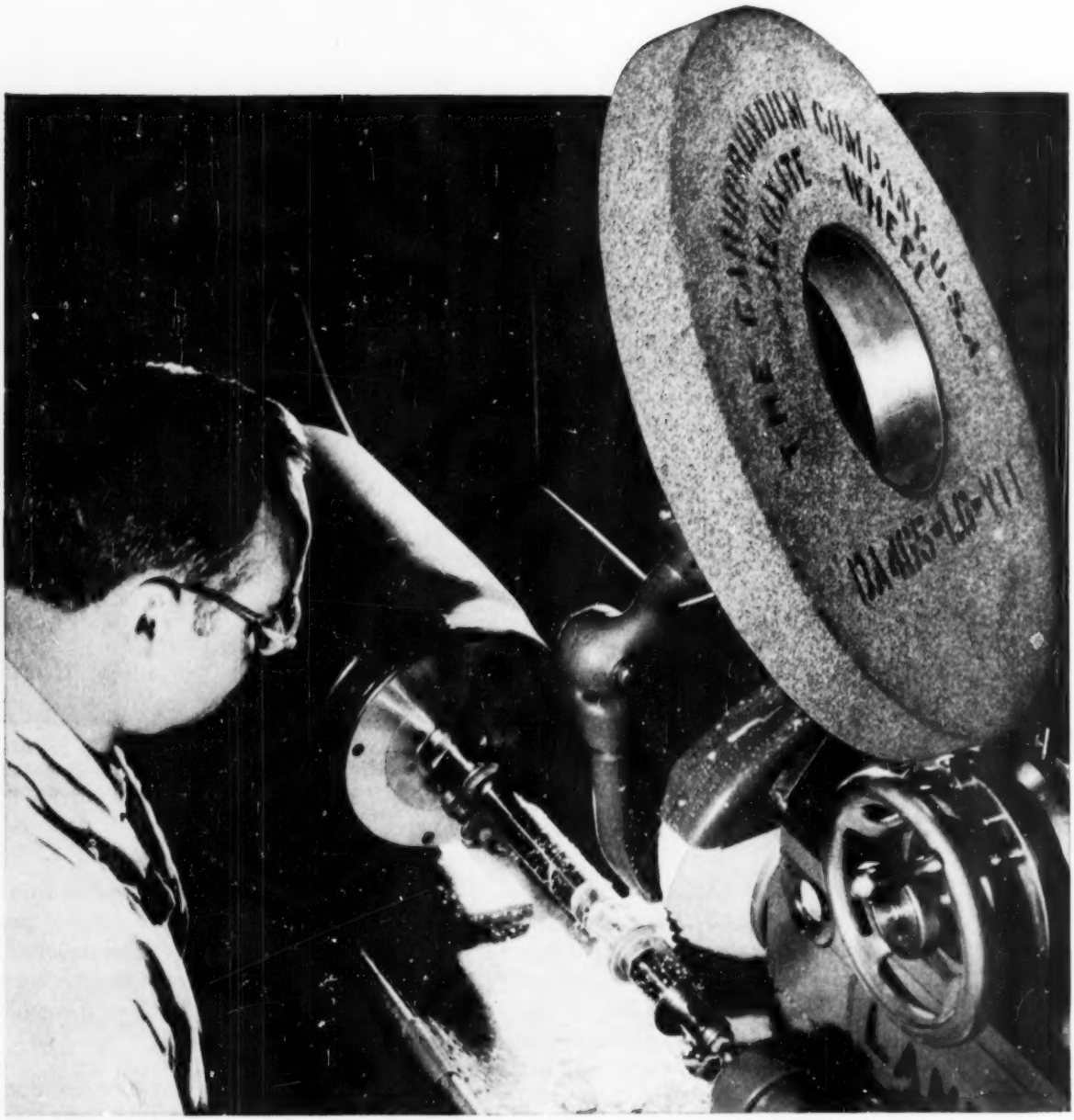
E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. **West Coast Representatives:** Moore Machinery Company, Los Angeles and San Francisco; Star Machinery Company, Seattle. **Other dealers** in United States cities and throughout the world.

BLISS ON YOUR PRESS IS MORE THAN A NAME...IT'S A *GUARANTEE!*

Use our CYLINDRICAL GRINDING



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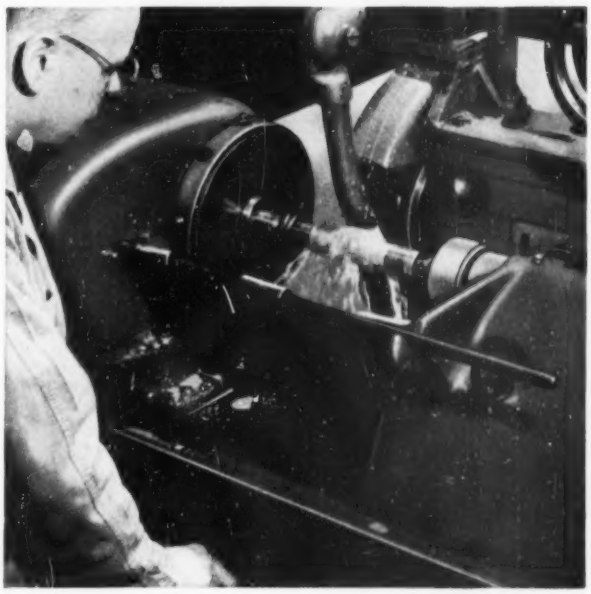
REGISTERED

WHEELS on your job

...see *proof* that the right grinding wheel improves quality...boosts production...cuts costs

Make an *on-the-job* comparison of CARBORUNDUM's cylindrical grinding wheels with the wheels you're using now. Compare them for speed and accuracy of cut...for cool cutting action...long wheel life...economy. Find out what the *right* grinding wheel by CARBORUNDUM does for you—on your plain, universal, or special-purpose cylindrical grinder.



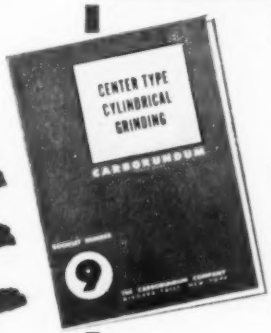
HOW TO CHOOSE THE RIGHT WHEEL

Your CARBORUNDUM Salesman or Distributor is the man to call. He'll visit your plant, analyze each part of your cylindrical grinding operation—your machines... the material you're grinding... your tolerance and finish requirements... the production rate you're after. Then he'll recommend the *right* combination of abrasive grain, grade, structure and bond—all engineered by CARBORUNDUM into a precision grinding wheel designed to give you the exact results you're looking for... the wheel which will give you highest output at lowest cost.

MAKE THE TEST TODAY—DECIDE FOR YOURSELF!

Call your CARBORUNDUM Distributor or Salesman. He's listed in the yellow pages under "Abrasives" or "Grinding Wheels." He's your best bet for experienced counsel ...and for prompt delivery from complete stocks...for every grinding job you do.

Get this helpful booklet FREE



THE CARBORUNDUM COMPANY, Dept. AM 81-321
Niagara Falls, New York

Please send me your booklet, "Center Type Cylindrical Grinding."

NAME _____ TITLE _____

STREET & NO. _____

CITY _____ ZONE _____ STATE _____

☐ Also send. Catalog No. 50—"Grinding Wheel Selector."

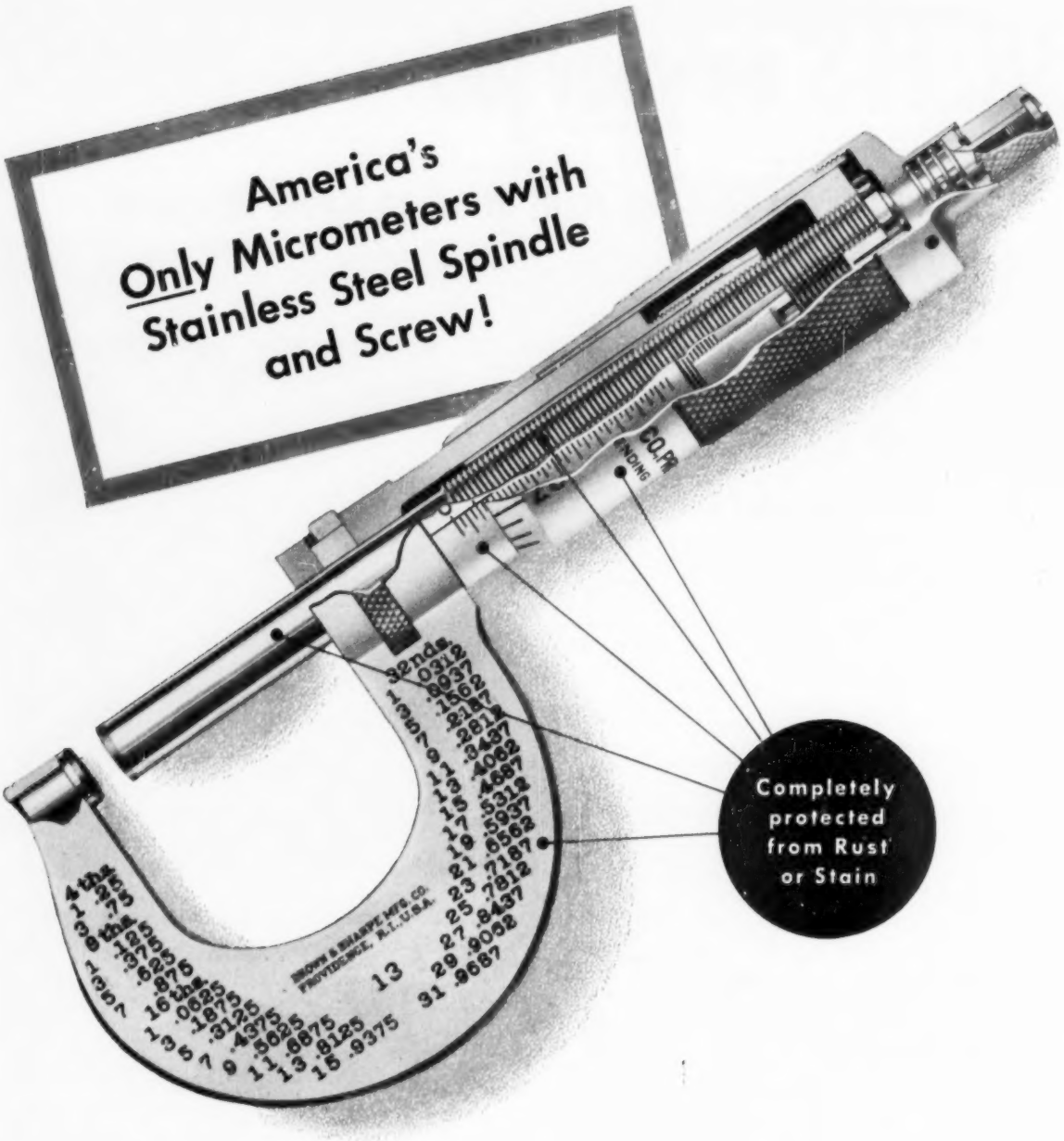
☐ New Simplified Basic Prices of Grinding Wheels.

RUNDUM

TRADE MARK

...the ONLY source for EVERY abrasive product you need

81-321



New Brown & Sharpe Micrometers give you complete protection from common causes of excessive wear and loss of reading accuracy . . . rust and stain. Exclusive stainless steel, one-piece spindle and screw with hardened and ground threads is permanently rust-proof. Dull chrome frame and thimble resist acid perspiration and other causes of stain.

Many other quality features, such as carbide measuring faces and large diameter thimbles with easy-to-read graduations, make these new micrometers longer wearing, more accurate, and easier to use. Like all Brown & Sharpe Products, they are designed to be the best obtainable. Write for Catalog 35M. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

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CLEEREMAN JIG BORERS

Precision—

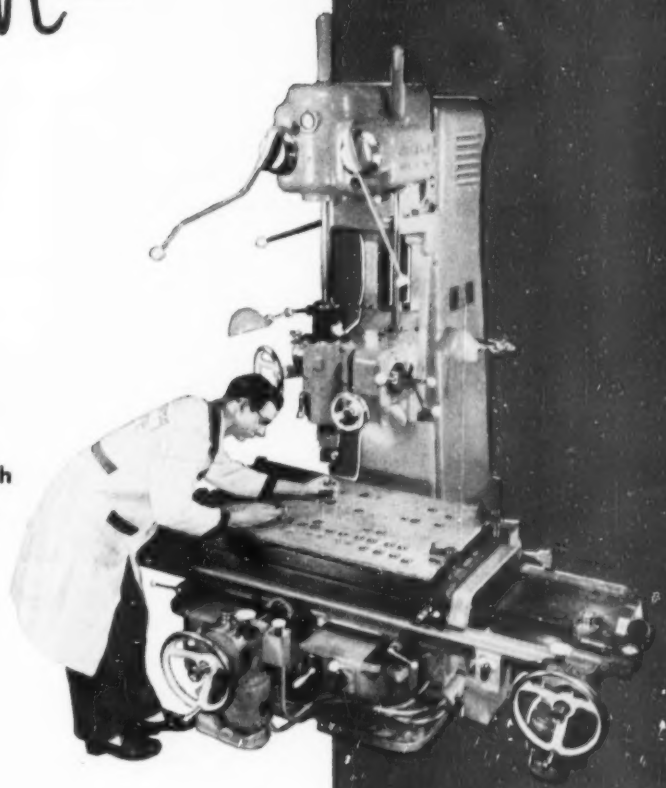
by

CLEEREMAN

. . . for ultra-fine tolerances on highest quality gage, tool, die, jig and fixture work—and on "jigless" production

. . . to stand the gaff in today's high pressure tool room and production plant service

. . . for higher profits and higher output through the ultimate in operating ease and efficiency



AFFILIATED WITH

CLEEREMAN MACHINE TOOL CO. Green Bay, Wisconsin

BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

Here's Proof

The New Thompson Type 2F is a SUPER PRECISION Tool Room Grinder

WEBBER GAGE COMPANY
12900 TRIBNETT ROAD - CLEVELAND 11, OHIO

Mr. Wilson, Vice President
Thompson Grinder Company
Springfield, Ohio

Dear Mr. Wilson:

We recently installed a new THOMPSON Tool Room Grinder to grind Gage Blocks to our specifications and tolerances. The results have been very satisfactory, in spite of the close limits to which the work has to be done. We thought you would be interested in the performance of this machine.

Very truly yours,
WEBBER GAGE COMPANY
George D. Webber

Thompson 2F Grinder Photographed in the Webber Gage Co., Cleveland Plant

COMPARE THIS NEW 8 x 10 x 24 TOOL ROOM GRINDER

When working to a tolerance of four millionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.

Handy control panel.

- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

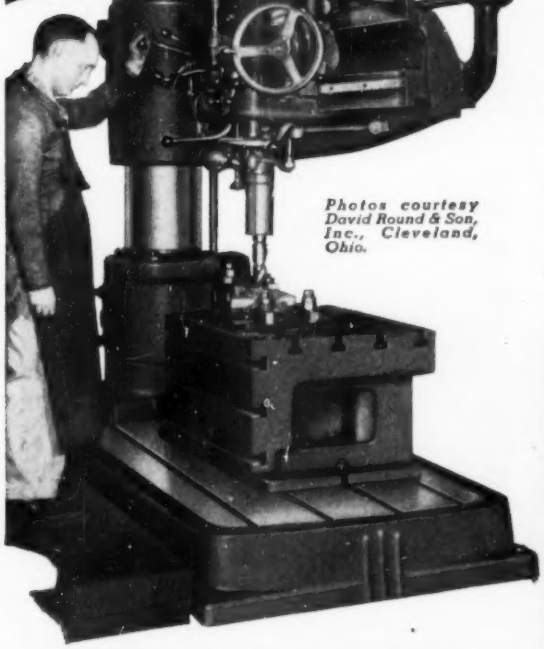
The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

before, ~~20~~ minutes...

now, 6 minutes



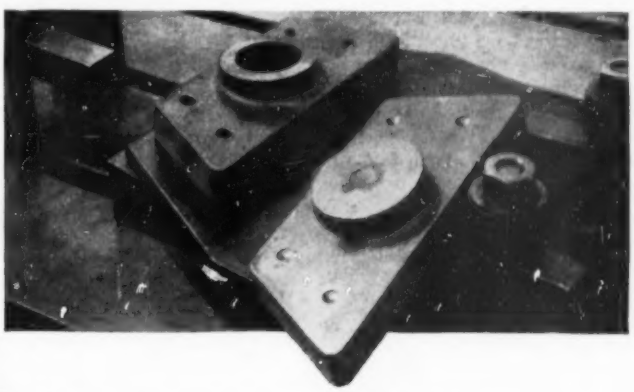
Photos courtesy David Round & Son, Inc., Cleveland, Ohio.

The outstanding performance of this Cincinnati Bickford Super Service Radial Drill brought approximately 50% cost savings at David Round & Son, Inc., manufacturers of cranes, hoists, winches and trolleys.

For example on the 4 ton steel trolley sides the time on drilling and reaming fell from 20 minutes to 6 minutes.

The right Cincinnati Bickford Super Service Radial Drill may effect parallel savings in your shop—Investigate.

Write for Catalog R-29.



CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

For the long haul... Autocar relies on RB&W bolts

Famous truck builder rates them best for ease of assembly and accessibility

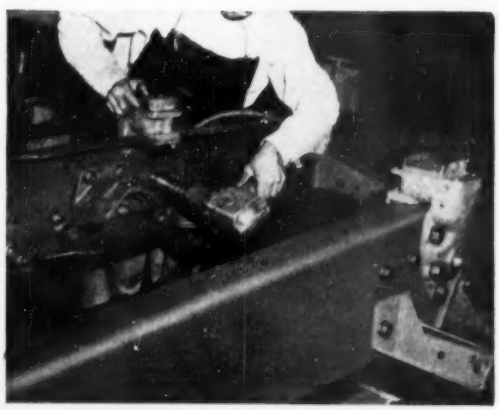
It's been a long time since the Autocar people switched from riveted to bolt-and-nut construction. Here's how it happened:

Two Autocar engineers took off on a coast-to-coast run to shake the bugs out of a new test model. Things went well until a riveted spring bracket broke. It took an entire day just to chisel through the rivets because it was hard to get at the bracket.

From that day on, it was *accessible* bolt-and-nut construction exclusively for all Autocar trucks. And Autocar standardized on RB&W bolts. One dividend from using these rugged bolts is that Autocar can specify higher-strength material than is practical for riveting. Furthermore, tests on structures like bridges show that rivets frequently loosen. This doesn't happen to bolts on Autocar frames.

Where you want to join structural members firmly together so they'll *stay* together for good, high-strength bolting is often your best bet.

As the leading manufacturer of all kinds of fasteners, we're in the unusual position of always being able to recommend and supply the right ones for all your needs. Write to RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY, Port Chester, N. Y.



FASTER FASTENING is achieved in the Autocar plant at Ardmore, Pa., by using air tools like the one shown here to run up RB&W nuts on RB&W bolts on an Autocar truck frame. In addition to making tight, accessible joints, bolting effects substantial assembly savings.

3.1

RB&W

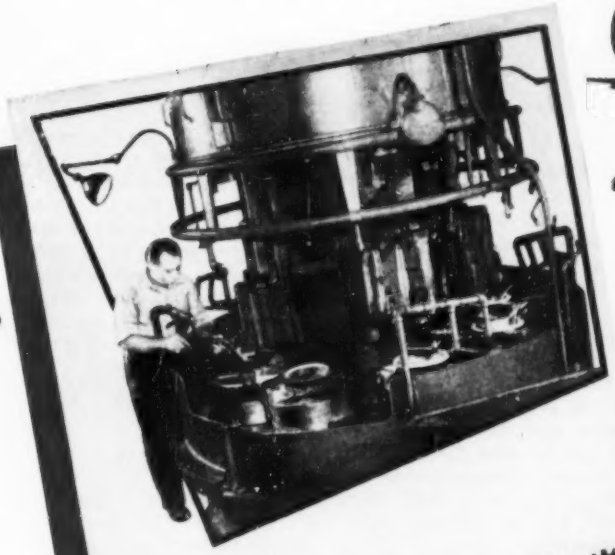
108 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

Plants at: PORT CHESTER, N. Y., CORAOPOLIS, PA., ROCK FALLS, ILL., LOS ANGELES, CALIF. *Additional sales offices at:* PHILADELPHIA, PITTSBURGH, DETROIT, CHICAGO, DALLAS, SAN FRANCISCO. *Sales agents at:* PORTLAND, SEATTLE. *Distributors from coast to coast.*

. . . a customer speaks with

CONFIDENCE

in his manufacturing equipment



Quantity Production . . .

• Quantity production of identical gears offers a challenge that we here at BRAD FOOTE are eager to accept.

• Multiple spindle machines, duplicate machines, numerous and varied machines, every machine that's needed—PLUS men of long experience making close tolerance gears . . . these factors make it possible for us to confidently accept such a challenge.

• When you specify BRAD FOOTE gears, you do so with the knowledge that each gear will be made to exact specifications, that every gear of a quantity will be identical in structure, in size, and in appearance, that each operation on every gear will be performed by BRAD FOOTE people in BRAD FOOTE shops. No one will share our responsibility.

• You will be satisfied with the BRAD FOOTE gears you buy because they will give long, economical service on the ... you operate, or on the machines you sell.

• Your inquiries invited.

BULLARD

Mult-Au-Matics

have earned this confidence in many plants.

Mult-Au-Matic accuracy and efficient production are key notes from satisfied users.

Where others profit from Mult-Au-Matic installations, you too can benefit. Ask Bullard for surveys on your work.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

Keep Your on the OLIVER Line
— Cost Cutting Production Boosting MACHINE TOOLS

OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated. For Drills No. 37 to ½

No. 510 For Drills ¼ to 3 — 2-3-4 flute

OLIVER [illegible] MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models

Bench Model 5-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5", with hydraulic feed.

OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keeps your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15", also, slab mills, fitting saws • all types cutters and reamers.

2 Models, Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 1½" wide x 1¾" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point, Tungsten-Carbide and high speed tools; offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

Write Today For Complete Information

OLIVER INSTRUMENT CO.

1414 E. MAUMEE ADRIAN, MICHIGAN

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Unbeliever

I am afraid Mr Rhodenbaugh has been drawing too heavily on his imagination when he describes the experience (*AM*—Aug 17 '53, p111) of an average man going into a large metalworking plant for the first time. It is utterly beyond belief that he could be turned loose on a Warner & Swasey when he had never even seen one before. To begin with, such machines are far too valuable and their output too important to be trusted to a green man. Even during the war, when companies had to hire anything that could walk, they didn't start a man without some proper instruction.

What kind of a large metalworking plant is it that doesn't have a safety man to see that the new employee doesn't needlessly expose himself to danger? And what is the foreman doing that he doesn't have some idea of what the new man can do?

Sure, accidents can happen. I, too, have seen a woman scalped by a drillpress spindle, and a man dragged around a lathe bed by a loose necktie. But it wasn't through ignorance on their part; it was deliberate disregard of safety regulations which had all been carefully explained to them.

I fully agree with Mr Rodenbaugh's outline of a proper training program, but he seems to think he is proposing something new. That's the way it is done in any plant I have worked in, and I've worked in quite a few in my time. Only I don't quite see what he hopes to gain by running the machine spindle at a low rpm. If the trainee is as green as he seems, the turning spindle is an invitation to danger.

Charles Leslie
Pittsburgh

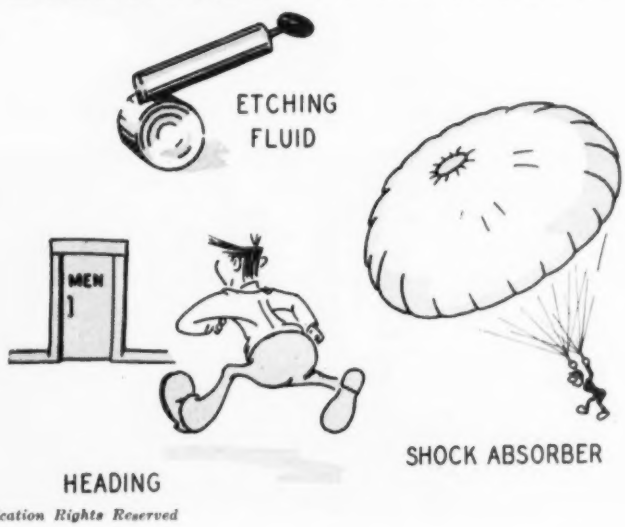
Eureka

A letter from A T Renson (*AM*—Mar 30 '53, p740) states, "in my shop, 26 men have 26 angle plates, no two are alike, not one is perfect. Correct them? Where is the perfect master?"

We have recently purchased a tool called the Precision Squaring Fixture, which solved our master square problem and would solve his. The fixture consists of a cast-iron base and three perfect cylindrical squares which bolt to it. When we ground our angle plates, we first put the base on the grinder and took a very light clean-up cut to true it to the run of the machine. Then we bolted

GRINETICS

BY D G SMITH



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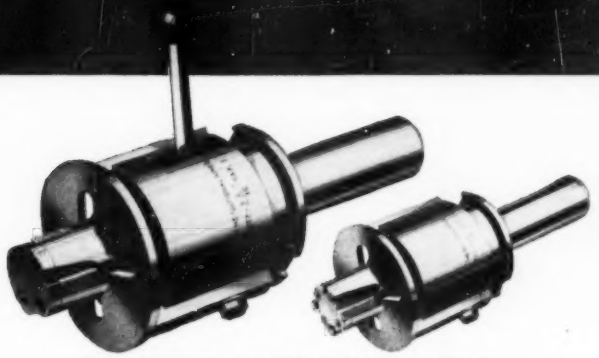
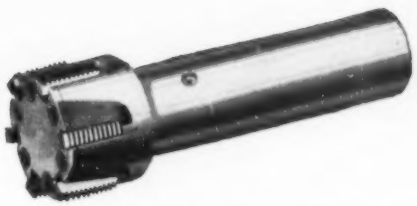
don't take chances when TAPPING

★ either in the quality of thread you need...

or on the time you expect to save

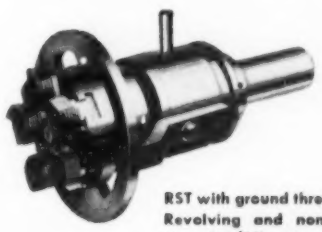


RST with ground thread radial blade chasers. Revolving and non-revolving. Range 1-1/4 to 4" in 8 sizes.



RSA Solid Adjustable Tap with ground thread radial blade chasers. Range 1-1/4 to 4" in 8 sizes.

RES-L Positive Receding Action Tap with differentially spaced ground thread circular chasers for 4-1/2 to 13-3/8" taper couplings. Two bodies and one additional nose piece cut entire range. Or with blade chasers, range 2-3/4 to 4". Larger sizes on application.



RST with ground thread circular chasers. Revolving and non-revolving. Range 3 to 5-1/2" with one body assembly and 3 core pieces.

Unless both have been engineered and proved out at the tool source, freed from experimental hazards such as down-time and scrap loss *in your shop*—your internal threading costs will still be a gamble.

NAMCO BASIC ADVANTAGES IN DESIGN – Relatively few parts, core piece rigidly supporting chasers. Instantaneous positive collapsing action so important on blind hole tapping. Parts hardened for wear, not just toughened, and completely precision ground for accuracy. Adjustment to fine diametric limits made by one screw and rigidly held. Chasers quickly removable for regrinding.

ADAPTABILITY WITH MINIMUM TOOLS. Each size RST non-revolving Tap is quickly changed for revolving spindle machines simply by removing reset handle in hood—using same chasers. Also interchangeable chasers between collapsible and solid adjustable types.

GROUND THREAD CHASERS—are standard for all types and sizes—radial blade chasers 1¼ to 4" range and the famous circular ground thread chasers for sizes 3 to 5". For the Oil Industry the RES-L perfected receding action with differentially spaced circular chasers has no equal.

Whether for class 3 threads in fine instrument work or dry seal couplings or medium tolerance jobs or commercial straight or taper threads—ask us to show you how these Namco precision taps with ground thread chasers can take the experimental headaches out of your tapping, give you smoother threads—and save you plenty.

Ask for specifications DT-52 or send sample

The NATIONAL ACME COMPANY

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Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle—Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing

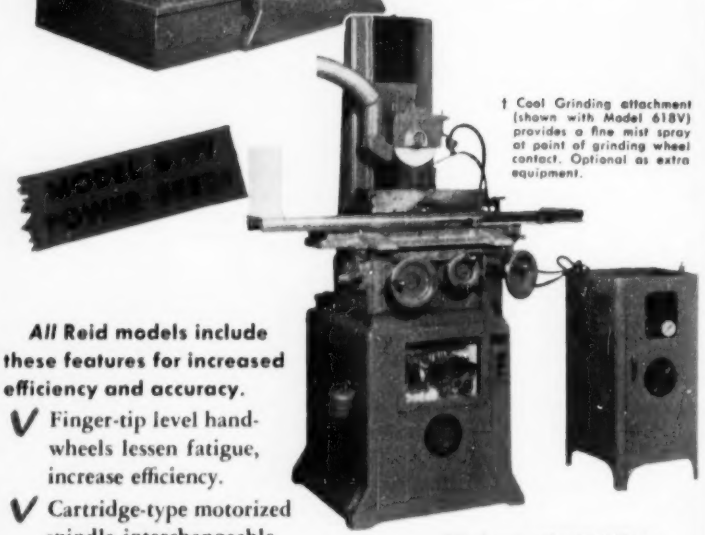
REID

of course there's a reason

It's also a fact that preference is divided between Reid models — some shops and operators give first choice to the power-table type; others prefer the hand-feed models.

It depends on the work, the operator, and sometimes just shop policy.

* Wet grinding attachment (shown with Model 618H) provides a flow of coolant over work. Optional as extra equipment.



† Coal Grinding attachment (shown with Model 618V) provides a fine mist spray at point of grinding wheel contact. Optional as extra equipment.

All Reid models include these features for increased efficiency and accuracy.

- ✓ Finger-tip level handwheels lessen fatigue, increase efficiency.
- ✓ Cartridge-type motorized spindle interchangeable within minutes.
- ✓ Rugged one-piece column casting mounted on base insures alignment, eliminates vibration.

Find out why REID is preferred by industry for precision grinding. For a complete description, request Bulletin 618-1.

Reid Brothers Company, Inc.

BEVERLY, MASSACHUSETTS

two cylindrical squares to the base and clamped one face of the angle plate to them. This held it perpendicular to the travel of the grinder. After grinding the upper face of the plate, we clamped the ground surface to the two squares and ground the second face. Then we applied the third cylindrical square to the base and clamped the two finished surfaces so the first two squares held one surface and the third located the second face perpendicular to the machine's travel. We then ground the edge. The remaining edges were ground from the magnetic chuck of the grinder.

Plates ground with this fixture have all checked within two ten-thousandths, and it has definitely solved our squaring problem.

Earl Hotchkiss
Sup't of Tooling
Blanchat Machine Co,
Wichita, Kansas

No Guesses

I work in a moderate-size shop, about 75 men, and we turn out some fine work. How we do it is a mystery, for our machines are the worst old klunkers you ever saw. The boss is nearly 80 years old, and when anyone suggests replacing an old machine he always insists that "There's lots of life in it yet." We still have several machines on which he proudly states he served his apprenticeship.

Now and again we do get a new machine, but it is never one that will really do us any good. For instance, we had an old shaper that we used perhaps once a month. He got rid of it and installed a brand new hydraulic job that is still used only once a month. But the prehistoric lathes and mills still go on and on. When I asked him why he bought the new shaper he "guessed we needed it."

In spite of the ancient tools we do fine work, because we have a bunch of fine men, but if we had new tools we could do twice as much at half the cost. Is there any way I can convince Grandpa (yes, he's my grand-

father) that new tools would pay for themselves?

Name withheld

Indeed there is! Study and apply the MAPI formula to your machines. Or read AM's 1954 Planbook, appearing in mid-November, showing a simple formula and case histories of replacement policies.—Ed

Idle thoughts

I had just finished looking through a folder on Piezotronics and came to the conclusion that I had reached the zenith in wonderment. Casting that aside, I went back to my old love, the "Talking Shop" page of American Machinist for further enlightenment on what was going on in the productive field. "Listen to this, Eadie," I said to my wife who sat beside me reading the woman's section of the local paper, "if you look through that information on Piezotronics you will find something to wonder at, but this has that skinned a mile: To think that they can make a bearing that is as small as 0.100 in. on the outside and 0.025 in. for its *ID.*"—(*AM*—Aug 17 '53, p 145)

"What's so wonderful about that?" frowns my dear companion.

"It isn't that, dear, but there are six 0.065 in. balls contained within them. Then the editor has the nerve to warn anybody not to try to assemble one if his hand trembles!" But he redeems himself in commenti on "Fathers." I was particularly reminded, when I read the second definition, of a poem revealed by a rugged philosopher of my acquaintance who wielded a trowel loaded with heavy mortar seven days a week—week after week. This chap would bring his contraption-loaded truck to a squeaking stop and invite me into the seat and give out with some of his anthological jewels. I bring this poem to light as it is so fitting to the needs of those who fail to realize the potential depth of a child's love:

However humble the place I may hold
On the lowly trails I have trod,
There's a child who bases his faith on me;
There's a dog who thinks I am God.
Lord keep me worthy—Lord, keep me clean,
And fearless and undefiled,
Lest I lose caste in the sight of a dog
And the wide, clear eyes of a child.

By—C T Davis
John Homewood
Tujunga, Calif.

If you design or buy cutting tools, you'll find a "gold mine" of useful information in the Gorham Tool Catalog! Complete with pictures, application data and specifications covering such tools as:

- PLAIN MILLING CUTTERS
- HELICAL MILLING CUTTERS
- SIDE MILLING CUTTERS
- WOODRUFF KEYSEAT CUTTERS
- T-SLOT CUTTERS
- SAWS
- ROTARY SHEARS
- SCREW SLOTTING CUTTERS
- ANGLE CUTTERS
- END MILLS
- CONCAVE CUTTERS
- CONVEX CUTTERS
- CORNER ROUNDING CUTTERS
- TOOL BITS AND CUTOFF BLADES
- WORK REST BLADES
- SPECIAL SAWS
- WEAR-RESISTANT CENTERS
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- RAILROAD TURNING TOOLS
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PLUS A 30-PAGE SECTION OF ENGINEERING DATA Covering:

Methods of holding circular form tools • Calculation of circular form tools • Calculation of flat form tools • Designation of nose elements of single point cutting tools • Speeds and feeds • Controlling cutting tool performance • Cutting tool clinic • Brown & Sharpe tapers without tongues • Brown & Sharpe tapers with tongues • Morse tapers • Jarno tapers • Keyway chart (This section is included in the complete catalog. It can also be obtained separately for distribution among your tool designers and setup men.)

The Gorham Tool Catalog and as many extra copies of the section on Engineering Data as you can use are yours without obligation. Tell us how many of each you need, on your company letterhead.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

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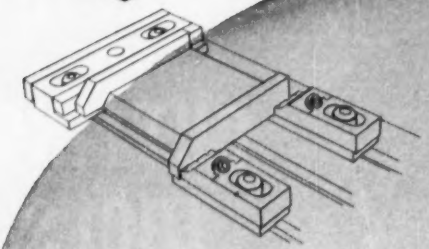
WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

J&S TOOL CO. INC.

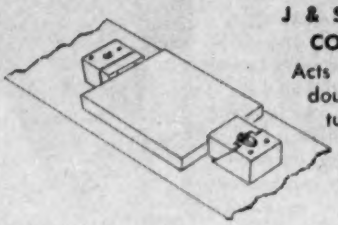


J & S DOUBLE ½ VISE
WITH MATCHING PARALLELS

- for unquestionable repeated accuracy
- for quicker set-ups
- for stronger grip
- for less obstruction

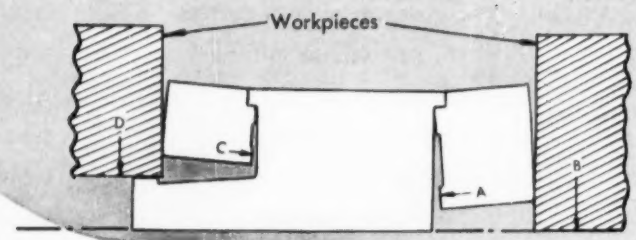
DOUBLE ½ VISE IN USE WITH ALL-PURPOSE JAW CLAMPS

for use on jig borers, millers, planers and shapers.



J & S DOWN-HOLDING COUNTER CLAMPS

Acts on same principle as double ½ vise (left). Fixture clamps operate on the same principle as the all purpose jaw clamps.



Hinged, Spring-Loaded Jaw Gives Positive Down-Holding Action

Hinged lip in-and-down action combined with in-and-down action of clamp holds workpiece against table and absolutely parallel. Construction is of oil-hardened tool steel, ground and blackened.

Jig Borers—quickly set up for jig-boring accuracy.

Millers—eliminates heavy miller vise and allows milling of more pieces.

Planers—eliminates strap and finger setups.

Shapers—eliminates vises.

Approximately 3 tons pressure closes Gap A, and approximately ½-ton closes Gap C—producing a down-holding action on each respective piece of approximately the same force.

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—contains complete details on advantages, applications, types and sizes available.

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model "REC" with detachable micrometer base

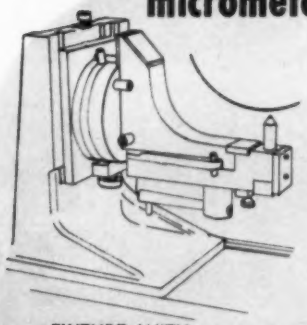
.0001" ACCURACY

Fluidmotion

WHEEL DRESSERS

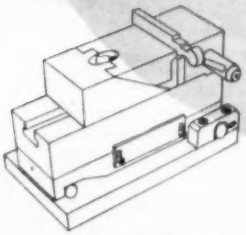
dress two angles tangent to a radius in one continuous motion

High-Carbon, High-Chrome Construction

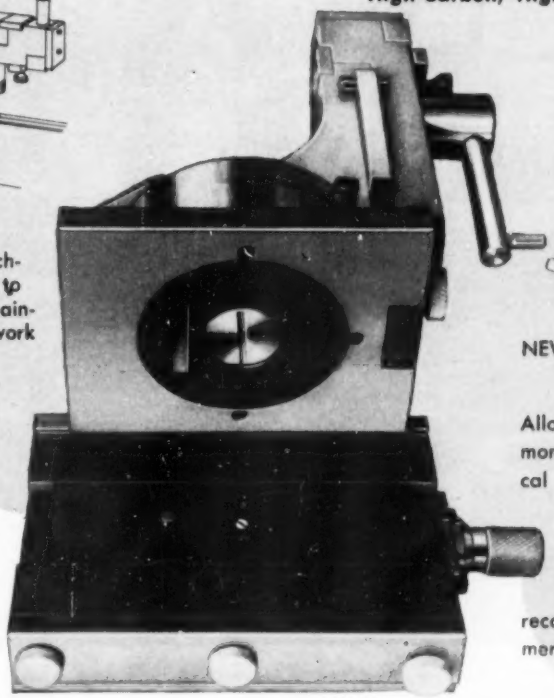


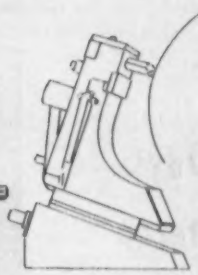
FIXTURE WITH MICROMETER FEED

Under the wheel attachment makes it possible to dress under the wheel, maintaining any desired work height.



Precision Grinding Vise with or without sine bar allows rapid unloading and exact relocating.





NEW SOLID ANGLE RAMP WITH MICROMETER LEAD SCREW

Allows fixed position of diamond when used in cylindrical grinding for dressing above the center line, but coincidental with the center line of the wheel. Factory will recommend proper equipment on request.

Adaptable to All Types of Cylindrical and Surface Grinders

By loosening gib, dresser can be removed from the micrometer "C" Base and affixed to solid or adjustable angle ramp for cylindrical grinding. For surface grinding the dresser is returned to "C" Base.

Photograph on right shows special compound base with micrometer lead screw having travel in four directions. Dresser usually is furnished with extra stops for zero setting.

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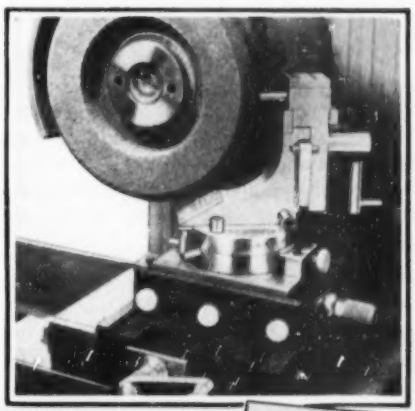

J & S TOOL CO. INC.

A variety of models and attachments to suit your needs. Write for free catalog covering dressers in detail. J & S also manufactures a complete line of All-Purpose Jaw (machine) Clamps, Vises, and Special Tools. Write for Machine Shop "Time Savers" booklet.

"It's the most solid, smoothest-running machine I've ever operated."

Says Veteran of Many Years on the Boring Mills at

THE TOOL STEEL GEAR & PINION CO. *(Cincinnati)*

The 72" boring mill pictured here is one of the many rugged, versatile KINGs with unmatched performance records at "Tool Steel." This particular KING is shown machining the inner diameter of a 50" O.D. ring gear—one of a wide range of jobs handled. At the controls is operator Arthur "Babe" Wilson. From long and diversified boring mill experience, Mr. Wilson knows the KING is really "king" in operating efficiency—and in the above quoted statement, he enthusiastically says so.

Massive proportions and extra-heavy construction give all KING machines the *rigidity* essential for fast, heavy work with consistent precision accuracy. Also, a wider feed and speed range plus simplified control make the KING adaptable for all types of boring, turning, and facing work—light or heavy, large or small.

KING machines are available in ten sizes, from 30" to 144", and in a variety of head combinations, with or without side head. For complete details, contact your local KING distributor—or write us direct.

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American Steel Foundries

KING MACHINE TOOL DIVISION

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SPOT NEWS of Metalworking

- **Chrysler will get a new contract to build T-51 tank recovery vehicles** at its Center Line, Mich, plant. The $50-million contract will avert a shutdown at Center Line when Chrysler phases out of M-47 tank production in November.

- **New Detroit concept:** a plant built on a flatcar or trailer that can be moved to a buying center for on-the-spot production of simple but bulky products. Examples: electrical enclosures, tin cans, glass-wool insulation, shock absorbers, virtually any bulky product built from a few compact materials.

- **Britain's largest machine tool,** a giant vertical boring and turning mill weighing 650 tons, is nearing completion at Craven Bros, Manchester. Machine's 41-ft diameter work table rotates at 450 fpm peripheral speed, and will take work pieces 42-ft, 6-in. diameter x 13-ft, 6-in. high, weighing up to 100 tons. Thirty-two motors, totalling 500 hp, are used in machine.

Second sources will bear the brunt of the recent 1000-plane Air Force cutback, and a follow-up elimination of 6000 jet and piston engines from the Air Force program. Principal engine affected will be GE's J-47 jet, designed for installation in Boeing B-47 bombers. But in the reshuffle, production of Pratt & Whitney J-57's will be stepped up, with Ford Motor Co as second producer of the engines.

- **Red China this year will devote 51% of all its imports to capital goods:** machine tools, motors, drills, tractors, vehicles, building machinery.

- **European machine-tool trends noted at the Brussels Show:** more copying attachments and copying lathes, more automatic sizing, electric controls replacing levers and hand wheels, a leveling-off in spindle speeds; a vertical copying lathe bed, an overhead bed. (See story on p164).

- **On the other side of the Iron Curtain,** lifted to let the West take a peek at Soviet bloc machine tools shown at the Leipzig Fair: a gear hobber that handles work up to 10-ft diameter, a double-column planer with over 6-ft working width and 39-ft planing length, optical jig borers, internal broaches (story on p170).

- **Quote from an anti-communist German tool expert at Leipzig Fair** — "The West would do well to keep a watchful eye on Soviet equipment. It's getting better every year and in 10 years' time will be sold cheaply all over the world."

Here are GM's goals for resuming Hydra-Matic production at Willow Run: five units per hour by Nov 16, increasing at a rate of five units per hour per day. Thus, by Dec 14 output will be 200 per hour. Ultimate goal: to reach pre-fire peak output of 500 per hour by January 18. Incidentally, GM put out a nationwide SOS for skilled toolmakers and machine operators, could get only half as many as needed, despite large numbers freed by defense cutbacks.

- **At least a year's backlog on fire prevention studies** and building alterations is reported by a major engineering and construction company as a result of the fire-consciousness brought on by the GM Hydra-Matic disaster.

- **Russians have had cold-extrusion data and equipment** since right after the war, and are reported to be making only indifferent progress in application to shell. The German developer of the process is in the US now, and is offering tooling help to American firms seeking to apply cold extrusion to commercial parts.

- **Brazing will replace welding of titanium for aviation engine parts** under terms of a contract awarded to Ferrotherm Co, Cleveland.

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52-25

Washington

Talk about freight absorption is back as steel production falls below 90% of capacity—a new low for the year. Experts figure mills will start pay-in freight charges in the not-too-distant future as they reach out for distant customers. Up to now, steel mills in general have been able to sell their output to nearby users at FOB mill prices.

Government anti-trust officials will okay the trend toward freight absorption. They consider this an additional sign of price-competition—and Eisenhower men running FTC and the Justice Department favor such "hard competition." But they will have a sharp eye out for anything like a return to the old basing point system dropped by steel mills after the Supreme Court decision on the Cement Institute case.

• • •

Hope for overhaul of tax laws dims. So-called "technical revisions to straighten out inequities" always cost money. And Treasury Secretary Humphrey has been plugging for tax boosts, not reductions. Odds still favor some tax cuts next year. But it's hard to tell where they will come. Excess profits will die, of course, and personal income taxes will be cut on schedule.

• • •

New Federal Reserve Board move to provide credit during seasonal money tightness has been expected for the past couple of weeks. The Board has been increasing bank reserves by buying government bonds—and talk of new lowering of reserve requirements has been persistent. Both measures would expand funds available for lending.

• • •

Aluminum stockpiling in the fourth quarter will be carried out at the heaviest level to date. Yet ODM claims civilian aluminum supplies during this period will still be as much as 6% higher than in July-September. One reason: new ingot production coming in. A lesser factor: lower requirements for military and AEC production.

But industry and Commerce Dept officials have objected to the increased stockpile schedules. They're skeptical about ODM's estimates on bigger supplies for civilian consumers. They also question "lowered military requirements." Aircraft production, which chews up most of the military set-aside of aluminum, will not be substantially cut in the fourth quarter at all.

• • •

The Pentagon has a new boss for industrial mobilization planning. He's Kenneth Turner, a GMC Truck Division executive. His new title: Special Assistant to the Assistant Secretary of Defense for Supply and Logistics. He'll be pulling the strings on whatever the Pentagon decides to do about the Vance Plan and the broad mobilization base concept in general.

• • •

Washington support is growing for a new shipbuilding program. The Eisenhower administration deleted a total of $120 million in proposed shipbuilding funds from this year's budget for the Maritime Administration. But insiders figure that a part of this at least may be restored next year.

It won't be for a whole new class of ships such as the mariner class now coming off the ways. What the new administration is shooting for is a number of "lead" type ships of several different varieties. The government would undertake developing the prototypes and industry would pick up construction of them after they had been proved in actual service. It may amount to as much as $100 million in new construction for the next couple of years.

Particular emphasis would be on new high-speed tankers plus new freighters designed to meet loading problems now confronting shippers. That would be new mechanical loaders carried aboard ship that would cut high stevedoring costs and be adaptable in any port in the world, such as the Farrell rolling wing deck now being tested by the Army.

• • •

Maritime figures that the minimum requirement in case of all-out war is an additional 250 ships. That's over and above the 1485 ships in the active fleet and the 1856 in the government owned fleet.

The need was set by the Defense Department, based on fleet requirements. But the new ships would have to be high-speed, high-capacity types capable of 20 knots or better and with at least a 9500 barrel fuel capacity.

• • •

Meanwhile, Maritime Administration is worried about the shipbuilding program. Unless new ships are contracted for within the next year, there's likely to be less than a dozen ships under construction in US yards by the end of next year and none in 1955. Already there are only 21 being built for private account, 24 for the government, 17 for foreign nations and five for great lakes in US yards. All are due to be completed before the end of next year and new orders are not coming in.

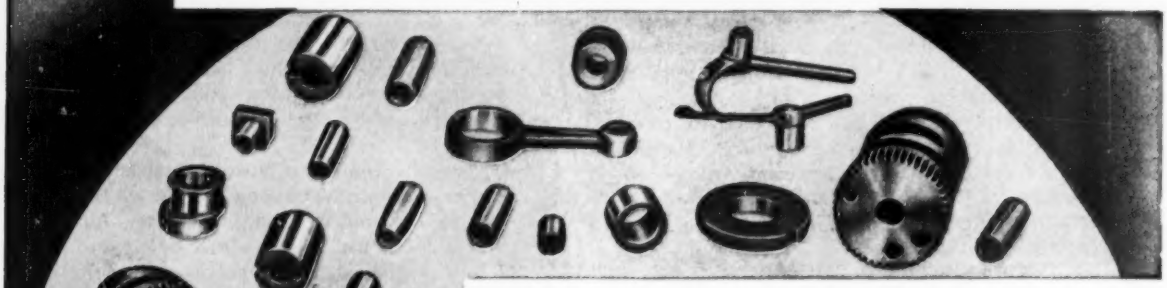
• • •

Durkin's resignation as Secretary of Labor was inevitable as long as he insisted on fighting for AFL and CIO. This didn't fit in with the Eisenhower administration's plans for improving the Taft-Hartley law for the benefit of both labor and management.

FOR PRECISION

PLUS PRODUCTION . . .

PRECIS-O-NIZING



OLD mass production methods are not enough to satisfy a market that is demanding both *quality* and *lower prices*.

Only through modern precision-production techniques can a manufacturer hope to use this two-edged sword to his own advantage!

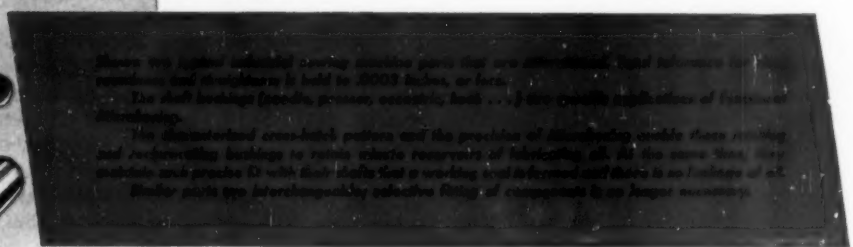
Because of this need for a productive method of generating precision . . . the Microhoning process was evolved. For a quarter of a century the Micromatic Hone Corporation, working with industry, has led the honing field in the development of equipment that would productively finish parts within the ever-shrinking tolerances of new designs and standards.

This applied precision-adeptness of the Microhoning process is "PRECIS-O-NIZING".

In one economical operation Microhoning abrades stock rapidly and efficiently with a minimum of heat to generate—

—bores that are round and straight
—accurate diametric size
—a functional characterized (cross-hatch pattern) surface finish that is free of smeared or distorted material.

The processing of sewing machine parts is an example of PRECIS-O-NIZING.



Microhoning equipment is available to handle all kinds and sizes of parts . . . from soft non-ferrous metals to hardened steel and special alloys . . . from .078 to 60 inches in diameter and from ¼ inches to 75 feet in length.

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Detroit

You can set auto executives running off in all directions today at the drop of a question: What's the auto sales outlook?

There is a remarkable lack of consistency among these industrialists who generally stand rather near one another in market analyses.

There is also a refreshing candor in the comments of some company officials, as, for instance, the announcement by Harold S Vance, Studebaker president, that his company would reduce production rates by a third, a whopping cutback by any standard. Instead of thinly masking the announcement with one excuse or another, Vance freely admitted that dealer stocks were too high—not only Studebaker inventories, but those of other auto makers, as well.

That frank confession from South Bend momentarily derailed some Detroit rivals, angered others and brought smug smiles to the faces of still others—the latter being those whose cars continue to be snapped up by buyers almost as quickly as they come off assembly lines.

There is no doubt but what Vance's statement applies as well to several other companies as it does to Studebaker, but such bold honesty is regarded in most automotive circles as absolute treason. It is, therefore, difficult to find an auto maker who will agree publicly with Vance. One exception: Clyde R Paton, director of engineering at Willys, who willingly contends that the industry is out-producing the market. Paton's sentiments are echoed by several thousand dealers, but their perennial lament at inventory clean-up time is so common as to be looked upon as an occupational disease.

Although some executives, simply by refusing to comment on sales, in effect reveal that their companies are in the same fix as Studebaker, a good many others obviously are not. Facts and figures bear that out.

For example, over-all sales in July rolled along in good correlation with the high volume at the factories that month. R L Polk & Co, Detroit, reported that registrations exceeded 533,000 units—only 7000 under May and 9000 under June, the two months during which sales customarily are at peak levels.

And new car deliveries in August, said *Ward's Automotive Reports,* continued at an annual rate of 6-million sales. Industry plans further indicated that production this year could conceivably amount to nearly 6.4-million passenger cars.

That may prove to be too high but the Herculean efforts of General Motors to get production back to the torrid pace being maintained prior to the Hydra-Matic fire, combined with Ford's overtime operations, seemed to assure the belief that 1953 will be the second biggest production year in history.

• • •

Auto industry statisticians are not the only optimists. B F Goodrich Co estimates that total sales of passenger car, truck, bus, farm, airplane and industrial tires may well go as high as 102-million units this year. That would be only 4-million under 1950's record volume.

• • •

It's a wise and rare mechanic who can keep up with all the complex developments coming out of auto engineering departments today. Laden fore and aft and in between with new and improved accessories and equipment, modern cars defy even the mechanic who studiously reads each and every service manual.

To help mechanics stay apace with factory engineers, General Motors has set up in Detroit the first of 35 training centers to be established throughout the country. The center offers specialized courses dealing with developments in each of eight GM divisions. More than 500 mechanics from GM dealerships, independent shops and shops owned by operators of GM fleets can attend school at one time. Over a year's time, GM expects to enroll 5,000 students.

• • •

Ford's 40-millionth US-built vehicle rolled off an assembly line this month, 50 years after the company went into business. The company's total production accounts for nearly one out of every three cars, trucks and buses built in this country since 1900. As if that were not enough, Ford's foreign production amounts to about 5-million.

• • •

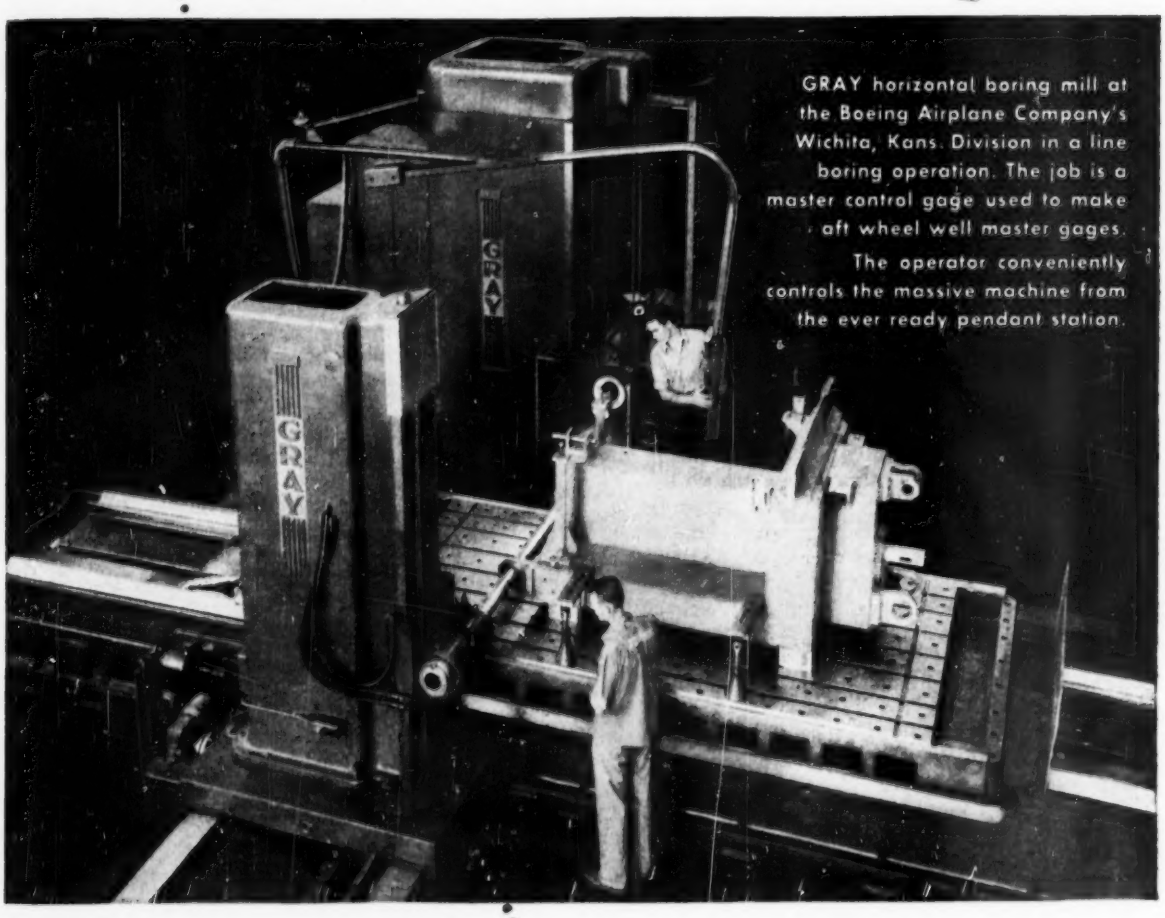
Motorists who like luxury and plenty of it built into their cars lack not for costly selections these days: air conditioning, power brakes, and power steering, automatic transmission, wire wheels, radio, heater, tinted glass, electric window lifts, white sidewall tires, turn indicator, back-up lights, windshield washer, seat covers, optional engine accessories and so on. Some of these items are standard equipment on some cars but buyers pay for them under any condition. The listed items in toto can easily put a $1500 nick in a checkbook.

• • •

An early clue to 1954 auto planning comes from Lansing. Oldsmobile reportedly is shooting for production of 420,000 cars. That would be nearly 25,000 units above Olds' all-time record. The increased production rate planning backs up reports that Olds will introduce one of the handsomest cars ever to carry its nameplate.

BATTING .000 IS TOPS IN THIS LEAGUE

That's why Boeing uses a GRAY 6" BORING MILL. The ultimate in precision is needed to line bore the master control gages that will be used to make master gages for B-47 Stratojet Bombers. Work of this type must be absolutely right—hitting .000" accurately and quickly is imperative—that's why a GRAY was the logical choice. GRAY's high precision, convenience, and modern speed is saving production dollars in hundreds of shops. Whatever your requirements—a GRAY will do the job—better—faster.



GRAY horizontal boring mill at the Boeing Airplane Company's Wichita, Kans. Division in a line boring operation. The job is a master control gage used to make aft wheel well master gages. The operator conveniently controls the massive machine from the ever ready pendant station.

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Machine Tools

The automobile industry is taking a major share of the attention of many machine tool builders.

Big orders are on builders' books for special machines for delivery as far off as the fourth quarter of 1954 and the early weeks of 1955.

This condition is not typical, of course, of the machine tool industry. But it does mean that some builders of specially-designed machines are booked solidly far ahead.

• • •

Ford and Chrysler are not willing to take a back seat with machine tool builders just because the latter are being pounded for deliveries of new and rebuilt machines by General Motors as a result of the Livonia fire.

General Motors, on the other hand, has key men, including some of its big brass executives, out visiting machine-tool companies that are rebuilding fire-damaged machines.

Many of the Livonia machines already have been rebuilt, some of them by builders who rarely if ever take back their own machines for rebuilding.

Several builders are said to have "dragged their feet" when asked to rebuild GM tools. But, on the whole, the machine-tool industry has responded magnificently to GM's request for cooperation.

All of the rebuilding work has been done merely on the basis of verbal orders rather than formal written orders, according to reports.

General Motors has put rebuilding jobs into many of its own car and parts divisions, like Pontiac and Fisher. It is said to have machine rebuilding work in about 145 outside shops, including machine-tool builders' plants.

• • •

After the Fourth European Machine-Tool Show is held at Milan, Italy, in September 1954, there will not be another European show until 1957.

The European Committee made this important decision in the final days of the Brussels show.

The committee felt that it would be impractical to have a show in 1955 at the same time as the projected show in this country at Chicago.

It also bowed to the wishes of the British industry for 1956. The British have reserved Olympia, London, for their next International Machine Tool Exhibition at that time. Their shows are held on a four-year cycle.

The 1957 European Show will be staged in Paris. After that, plans are not formalized. The thinking, however, is in the direction of skipping a year and having the sixth show in 1959 at Hanover, where the 1952 Exhibition took place.

The German industry apparently is not willing to wait until 1957 to display its machines. It is talking about putting on a show of its own in Hanover in 1955, the year of the US show.

The British, who recently became members of the European Committee, participated in the meeting at which the schedule for future shows was drawn up and approved. They are reported happy about the outcome.

• • •

"Back to selling" was one of the slogans heard at the annual meeting of the American Machine Tool Distributors' Assn at White Sulphur Springs.

Members were reasonably optimistic about prospects ahead for machine tool business. There was no weeping about the future.

One point that was clearly brought out at the meeting was this: the industry has no intention of asking Congress to increase tariffs on importation of machine tools. For full story on the AMTDA meetings, please turn to page 169.

• • •

The Armed Services, if Secretary Wilson approves, will go along with the Office of Defense Mobilization in restricting lease or rental of government-surplus machine tools to defense contracts on defense work. The question is whether Mr Wilson will okay this action. Ordnance has agreed to let its surplus machines for civilian output.

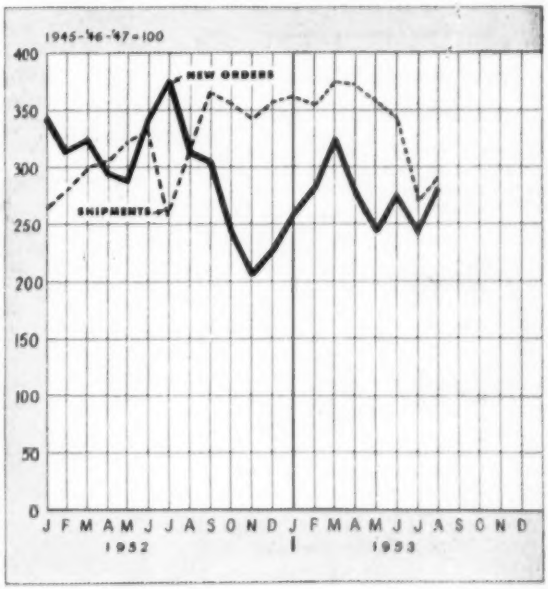
BF

MACHINE TOOL INDEX

(1945-47 = 100)

(Source: National Machine Tool Builders' Assn.)

NOTE: August figures are estimated. Several machine-tool firms had not reported at press time.



News About Created-Metals

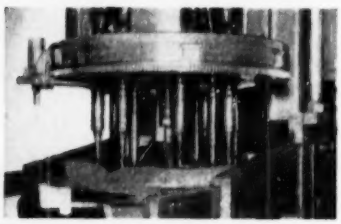
New "Brief-A-Log" Simplifies Ordering

A new condensed catalog and price list is being offered by the Carboloy Department of General Electric Company.

This "Brief-A-Log" (GT-265) incorporates Carboloy price reductions made June 22, and latest additions to the standard lines of tools and blanks.

Designed to simplify selecting and ordering, the Brief-A-Log is available free of charge. (Send coupon at right.)

Drill Cast Iron with Carbide Twist Drills



Drilling cast iron with carbide twist drills is definitely past the "maybe" stage. Users report doubled production, more than tripled drill life over H.S.S. drills, without any special drilling equipment or job engineering. Sound, how-to-do-it technical bulletins available free. Write Carboloy Department of General Electric Company. (See address at right.)

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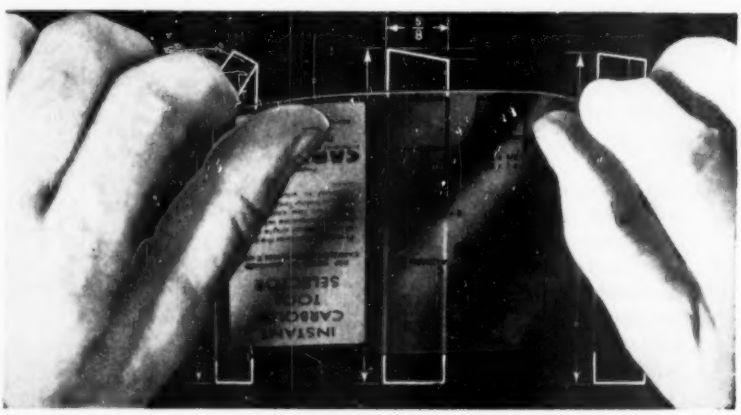
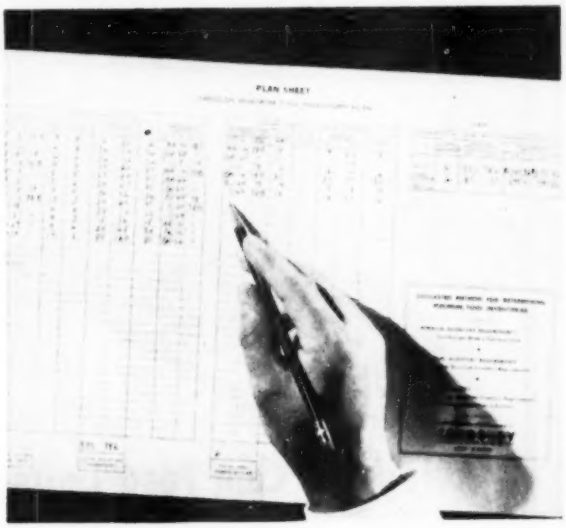
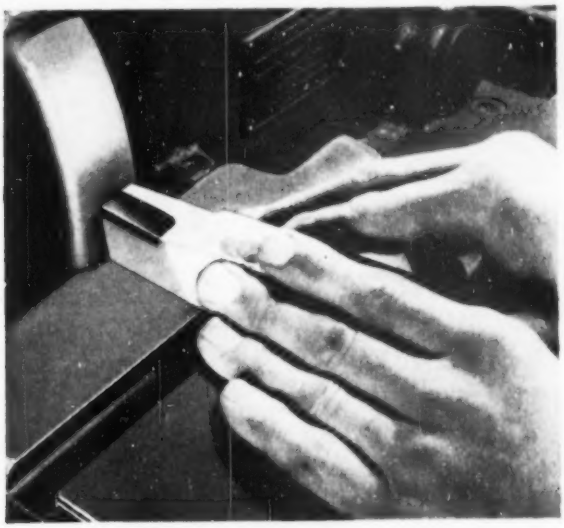
1. **Using the Instant Tool Selectors,** you'll see at a glance how only 11 Standard Carboloy Tools can be easily and quickly adapted to handle 4 out of 5 of your special, made-to-print tool jobs.



inventories of tools now unnecessary"





2. **With the handy Plan Sheet provided,** you'll quickly get a dollars-and-cents answer showing how much you'll save by standardizing. Simple subtraction shows you how much your inventories can be cut by using standards.

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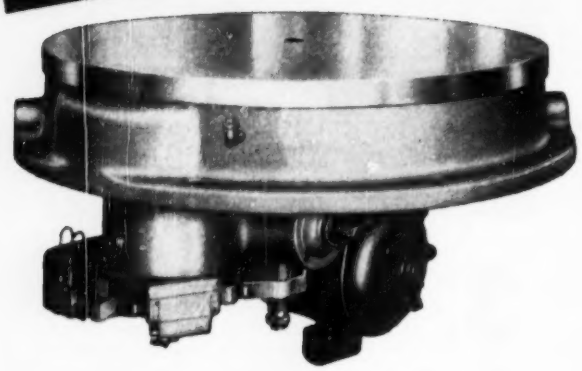

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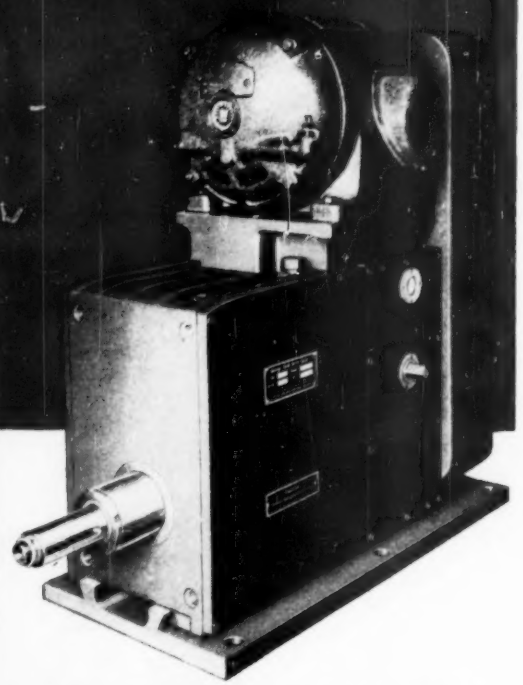

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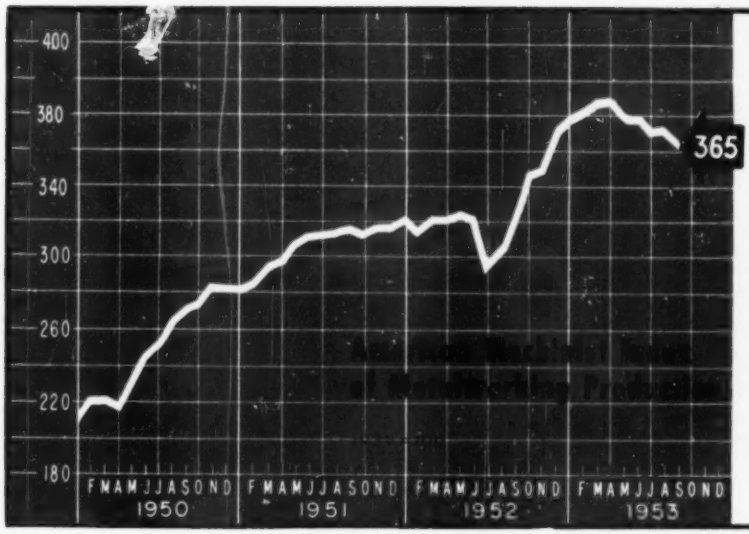
Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	SEPT '53(*)	AUG '53(p)	JULY '53(r)	AUG '52
Tot. Index	365	365	363	303
Machinery	320	325	298	
Electrical Machinery	410	403	354	
Autos	302	293	172	
Other Transportation	591	589	551	
Other Metalworking	364	360	302	

(*) Estimated (p) preliminary (r) revised

Metalworking production is edging off a bit in most sectors. The decline is not alarming. It merely signifies that the super-boom is about at an end.

It is hard to find any metalworking line that is unaffected. Automobile assemblies are not as large as they were. And they will taper further the final quarter.

Household appliances are in about the same situation as motor cars. Stocks in dealers' hands are seasonally heavy and output is off some. A few appliance makers, on the other hand, report sales holding up better than anticipated. Their production rate is not likely to slip much if at all the rest of the year.

Farm equipment business is one of the hardest hit. Factory schedules are sharply down and layoffs of workers have been sizable. Most of the men laid off, however, are said to have secured other jobs.

Dealers' inventories of farm implements are not much bigger than they were a year ago. But shrinkage in retail sales makes them more of a problem.

• • •

Capital goods demand has slackened. Current sales are considerably below production, with no hope of a change the remainder of 1953.

Industrial machinery orders in general are off from the level earlier in the year and are substantially lower than the Korean peak.

• • •

Armament operations, from planes to Ordnance items, are contributing importantly to overall metalworking production.

Many of the cutbacks and cancellations will not be fully felt until next year.

The downturn in metalworking does not spell bad times. It means a certain amount of reduction in hours worked, with overtime being cut by many firms. But layoffs have not been impressive except in the farm implement industry.

The electronics field is one of metalworking's bright spots. About 7.5-million TV sets are being turned out this year.

• • •

Steel is not much of a problem anymore. Some buyers, in fact, are worrying about taking all the fourth-quarter tonnage for which they are committed rather than about where the steel they need is to come from.

Plates appear to be one of the tightest items. Structurals are hard to get too in some parts of the country. Sheet, strip and light plate are easing.

Steel mills are booked well for the fourth quarter. Steel jobbers are happy because finally they have fairly well balanced stocks on hand.

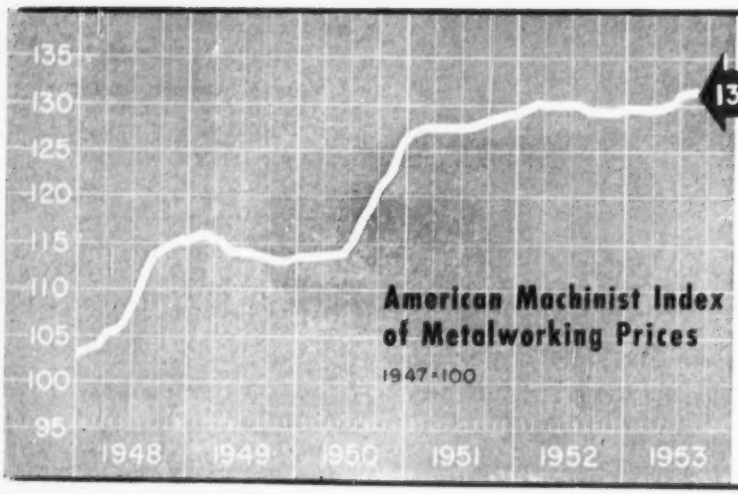
• • •

Steel castings people report incoming orders at 65% of the industry's expanded capacity. Backlog stands at 3.5 months at present production rate, compared with 6 months in late 1952 and 1.5 months normally. Plant operations have dropped from six days a week to five.

Independent stamping plants did about the same volume of business in August as in July. And July was higher than predicted.

Companies supplying stampings to TV and radio manufacturers are the happiest of the lot.

Gaging Business



PRICE INDEX

	SEPT '53(*)	AUG '53(p)	JULY '53(r)	AUG '52
Total Index	**131.9**	**131.8**	**131.5**	**129.6**
Metalworking Machinery	**140.9**	**140.8**	**137.9**	
Other Machinery exc. Electrical	**136.3**	**135.9**	**132.2**	
Electrical Machinery	**130.0**	**129.9**	**124.7**	
Fabricated Metal Products	**128.5**	**128.2**	**128.0**	

(*) Estimated (p) preliminary (r) revised

General business outlook isn't so rosy any longer. Business will be operating at fairly high rates for the balance of the year. But next year is bound to show a decline.

Compared to pre-Korea's economy, however, US business is extremely healthy.

• • •

Manufacturers' new orders in July indicate continued short-term high consumer demand.

In July, defense contracts let to transportation equipment producers declined considerably. And orders received by primary metal producers were 10% under those for June.

However, orders increased for machinery and fabricated metals, particular strength being shown by the electrical equipment industry.

• • •

Deliveries of durable goods manufacturers totalled $12.2 billion in July, 3% above June's rate. And the value of shipments of primary and fabricated metals and transportation equipment rose sharply during the month.

But electrical machinery shipments were off 8%. Other hard goods industries recorded little change during the period.

• • •

Non-durable goods manufacturers shipped $12.2 billion worth of goods in July. Food deliveries were up 6%, and beverage shipments gained 5%.

Offsetting these gains were declines in petroleum, leather, printing and publishing.

• • •

At July's end, durable goods backlogs represented five months of shipments at the July rate and totaled $67.2 billion.

The decrease in back orders during the month centered in transportation equipment. Virtually no change was reported by other hard goods manufacturers.

Sole exception to the decline in backlogs was reported by the manufacturers of electrical machinery, who added substantially to their unfilled orders during the month.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	255.3	255.4	246.0
Steel ingot production (thousand tons)	2,036	2,011	2,121
Electric power output (million Kilowatt hours)	7,963	8,694	7,654
Production of automobiles and trucks	122,497	132,574	137,295
Engineering construction awards (*Eng. News-Record*, millions)	$180.8	$321.0	$260.5

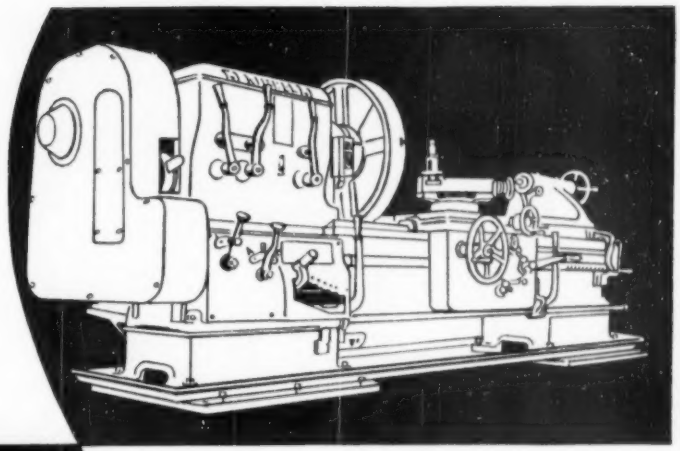
MONTHLY BUSINESS INDICATORS

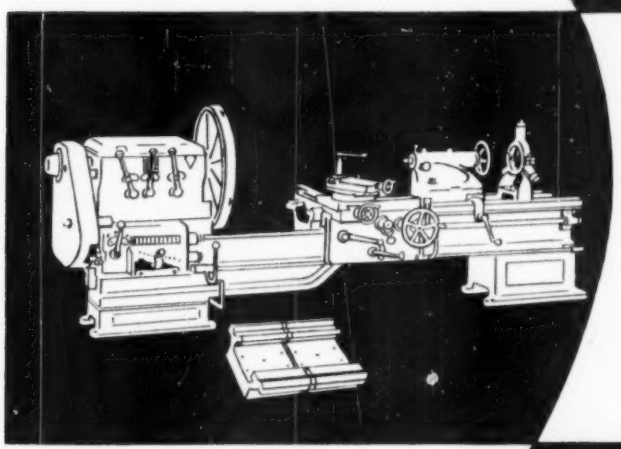
	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	330	343	366
Vacuum cleaners sales (thousands of units)	159	198	189
Washers sales (thousands of units)	228	304	208
Household electric ranges sales (thousands of units)	80	113	84
Radio production (thousands of units)	674	1,164	495
Television production (thousands of units)	316	524	199
Gear sales index (1947-49 = 100)	120.7	146.5	145.3
Foundry equipment new orders index (shipments, 1937-1939 = 100)	440.8	446.8	343.9

* Seasonally adjusted

Heavy Duty Engine Lathes

Ruggedly constructed and carefully designed for extreme simplicity . . . a lathe combination that will cost you little to buy originally and little to maintain through years of trouble-free operation. 16″, 18″, 20″, 25″, 27″, 32″ and 36″ swing sizes.



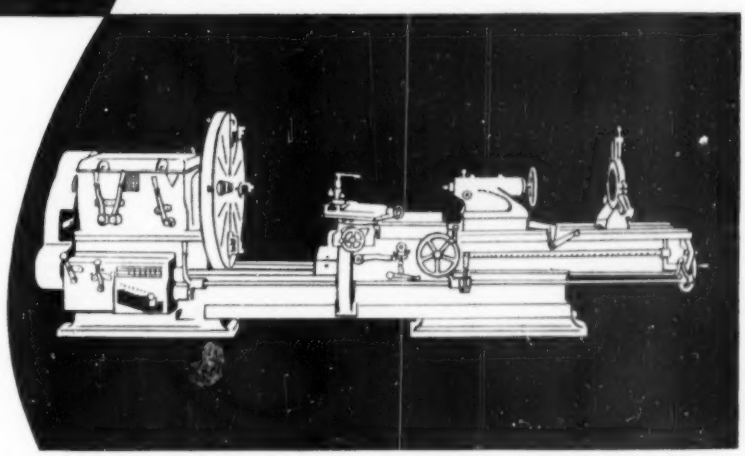


Removable Block Gap Lathes

These lathes have the increased swing capacity advantage of the Nebel Extension Bed Gap Lathes and at a considerable savings in initial investment. Removable block is furnished in two equal sections . . . thus providing gaps of two different lengths. Swing sizes 16″/27″, 20″/30″ and 25″/40″.

Extension Bed Gap Lathes

With its double bed design, this machine offers the productive capacity of two ordinary lathes. Opening the upper bed not only increases the distance between centers but also the swing capacity. Two sizes: 20″/40″ and 28″/50″.

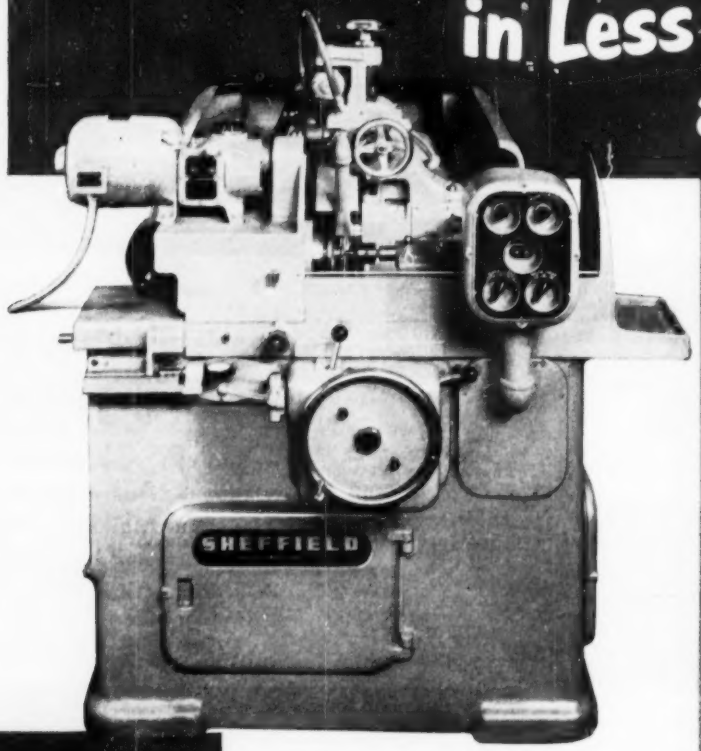


Nebel

WORKHORSE OF THE METAL WORKING SHOP SINCE 1899

THE NEBEL MACHINE TOOL CO.
3407 Central Parkway
CINCINNATI 25, OHIO

Savings amortize this CRUSHTRUE GRINDER in Less than a Year



To finish this sewing machine bobbin, both faces and O.D. of the flange are ground and outer corners chamfered. Formerly it required five men and five different machines to turn out 68 pieces per hour.

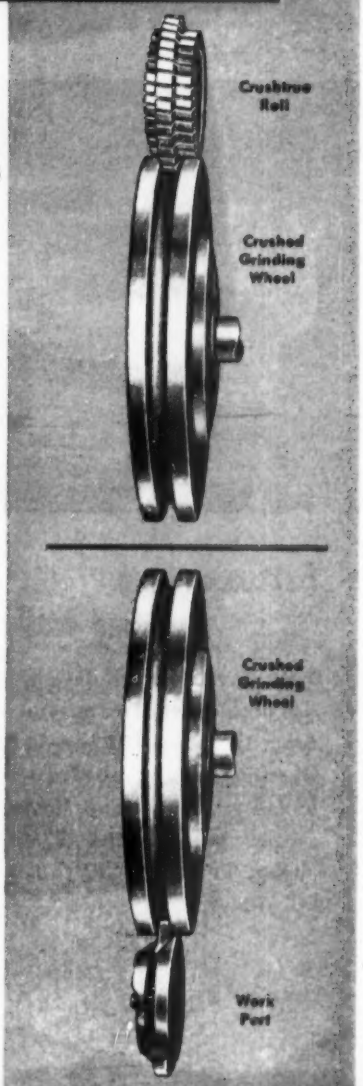
Now, **one** Sheffield Thread and Form Grinder, performs all **five** operations simultaneously—**one machine with one operator** instead of five machines with five operators.

And production is 85 pieces per hour instead of 68—**a 27% increase.**

The first 12 months' savings in direct labor were more than enough to pay for the Crushtrue Grinder.

Simple forms and threads—and profiles so difficult as to be considered almost impossible to reproduce otherwise—can be Crushtrue ground with savings as much as 70%.

Ask to see the automatic sound slide films on Crushtrue grinding—they can be shown in your office.



6289

SHEFFIELD HEADQUARTERS

the Sheffield CORPORATION
DAYTON 1, OHIO, U.S.A.

In Australia, the Sheffield Corporation of Australia Pty. Ltd., Melbourne

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Brawn Buys Few Potatoes

The current Bulletin of the German Federal Republic explains why a German factory employee must work longer to buy goods for his family than his American counterpart.

The fact is stressed that the American worker "has behind him a capital equipment five times bigger than that at the disposal of the German worker." The Bulletin then suggests that Germany must make large investments "to render the production apparatus as productive as the one in the United States."

Two years ago a distinguished British industrialist visited our country to find out why our industries are so much more productive than those in the United Kingdom. He arrived at the simple conclusion that American productivity is in direct ratio to the amount of horsepower in use.

If British industry wishes to raise its productivity, he pointed out, it can do so by increasing the horsepower available to the workers.

Why are the Russians and the Chinese so eager to buy machine tools from the western world? The answer is that they recognize that generous investment in modern machinery is the best and the only way in which to raise their standard of living and to produce both war goods and peacetime products.

The lessons of World War II were not lost on the Communists. They were eye witnesses to our fabulous output of armament of all kinds in the 1941-1945 period. And our standard of living did not slip much if any, as it did elsewhere, during those years.

The Germans, British and Russians, independently of each other, have reached the same conclusion. And their judgment should be meaningful to us.

They recognize the true and deep significance of the steadily increasing investment in production equipment of the average US factory. When they seek to emulate what we have been doing, they are doing more than flattering us. They would like nothing better than to come up to our high standard.

Perhaps it is heresy to question whether some American companies, and that goes for Metalworking too, appreciate fully how much the continuous pouring of funds into new capital equipment means to them. By contrast, our friends and enemies abroad realize its direct relationship to our prosperity and to our industrial supremacy.

The German government proudly states that the average German worker has to work a shorter time than workers in other European countries to buy a sack of potatoes or a pound of beef. That obviously is to the credit of the Germans.

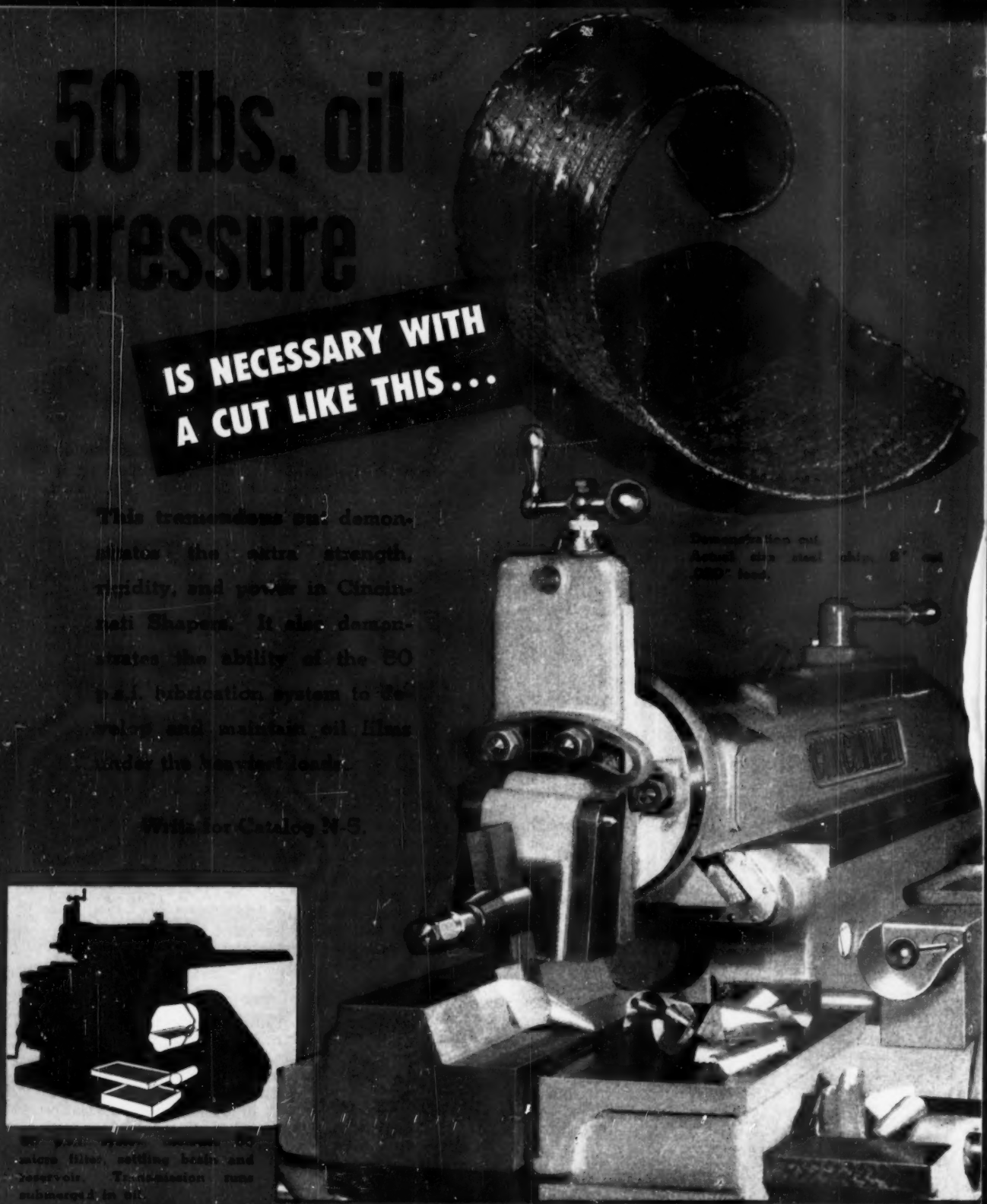
But let's not overlook the fact that the American worker can buy the same amount of potatoes or beef by working a far shorter time than the German. What's more, the American worker can buy an automobile, a refrigerator, a television set and many other products completely out of the financial reach of workers anywhere else, including Germany.

That makes it doubly important for us to remind ourselves constantly how much our continual pouring of money into new capital equipment means to all of us. It is well for management to keep it in mind, when thinking in competitive terms. It is well for Congress to keep it in mind when legislation to stimulate replacement of old equipment with new is up for approval.

Burnham Finney

50 lbs. oil pressure

IS NECESSARY WITH A CUT LIKE THIS...



This tremendous cut demonstrates the extra strength, rigidity, and power in Cincinnati Shapers. It also demonstrates the ability of the 50 p.s.i. lubrication system to develop and maintain oil films under the heaviest loads.

Write for Catalog M-5.

50 p.s.i. system includes fine micro filter, settling basin and reservoir. Transmission runs submerged in oil.

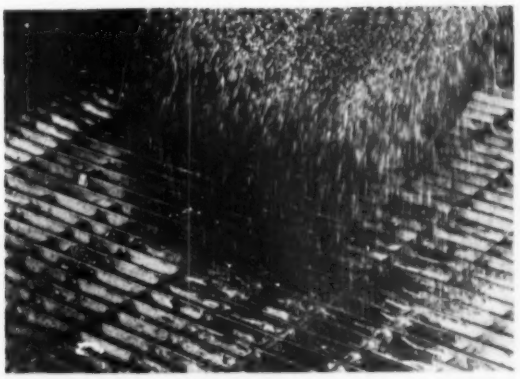
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

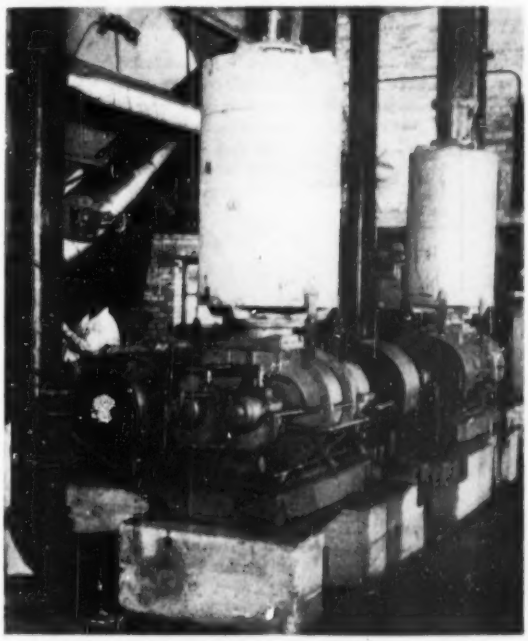
Pneumatic conveyors simplify Studebaker's chip handling

Here is how Studebaker processes metal chips at sharply reduced costs. The system is based on a new chip house and vacuum conveyor—all installed without interfering with the original machine-shop layout and without digging long underfloor conveyor trenches. It's an example of how to put a complete chip-handling system into an existing plant

BY OTTO H KLAUSMEYER, Chief Plant Engineer, and WILLIAM C TIEDGE, Asst Plant-Layout Engineer, THE STUDEBAKER CORP



CAST-IRON CHIPS are dumped through gratings to underfloor storage hoppers, from which vacuum conveyors feed overhead to main chip house in plant. Gratings keep out large foreign objects that would jam pnuematic lines



TWO BLOWERS in chip house provide power for pneumatic system that makes conveyors work. Each is driven by 75-hp induction motor and is equipped with relief valves and exhaust silencers

TO prevent cutting up its existing plant, Studebaker based modernization of its chip-handling facilities on three main points: First, a new chip house was built outside, but against the wall of the existing machine shop; second, two main National Conveyors Chipveyors were installed to carry dry cast-iron chips pneumatically from the plant to the house; and third, the conveyors were fitted and located to dovetail with necessary manual and truck handling of chips.

Three is also the key number in relation to the kinds of chips handled by the system. There are dry CI chips from normal cutting operations—about 65 tons in a two-shift day. There are oily steel turnings and borings—another 50 tons of material. And there are some wet CI chips, about 75 tons a month, gathered from flywheel facings and other spots where dry CI chips have fallen and gotten oily or wet.

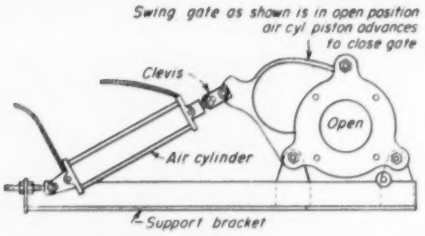
These three batches of chips must be kept separate; the dry CI can be blown pneumatically through the Chipveyor, but any wet chips would adhere to the walls of the tubing and "lock out" the vacuum lines. Wet CI chips can be drained in the chip house, then added to the other CI chips being processed there. Steel chips are handled separately.

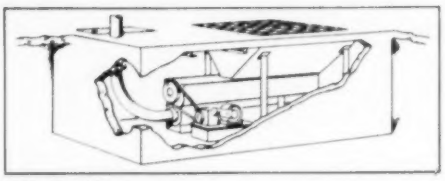
VACUUM CONVEYING

Dry CI chips are collected at the cutting machines either by conveyor (drag-chain types) or by special chip operators who tote them by wheelbarrow. They are dumped into the six feed stations spotted along the two pneumatic lines. These stations are in pits—which were the only underfloor construction required for the whole chip-handling system. Under each 5x5-ft grating is a hopper and 6-in. helicoid screw conveyor that moves the chips into a vacuum feed box. A rotary-swing gate valve closes off each feed box from its branch riser that leads to the main pneumatic conveyor.

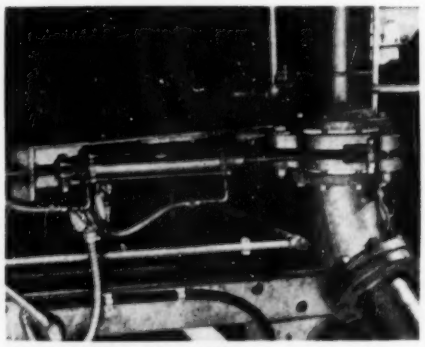
Each main Chipveyor is cycled to draw a predetermined load of chips from each feed box in turn (one at a time), making a cycle each 30 min, and

CHIPVEYOR NO. 2

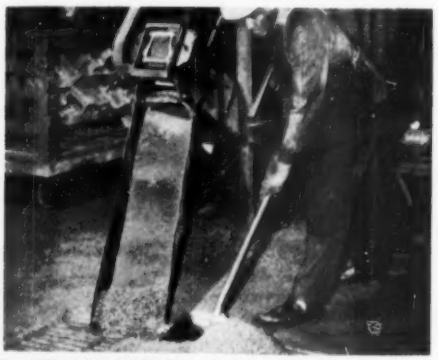




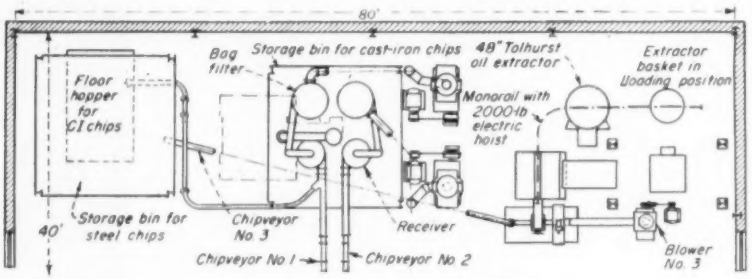
FEED STATION for vacuum conveyor is steel hopper that drops chips into helicoid screw conveyor, which moves chips to actual feed box



ROTARY-SWING GATE VALVE at top of each conveyor branch line is operated by air cylinder and controlled by solenoid valve. Valve is interconnected with feedscrew-drive motor in hopper below; when timer calls for chips from this station, both valve and motor are actuated



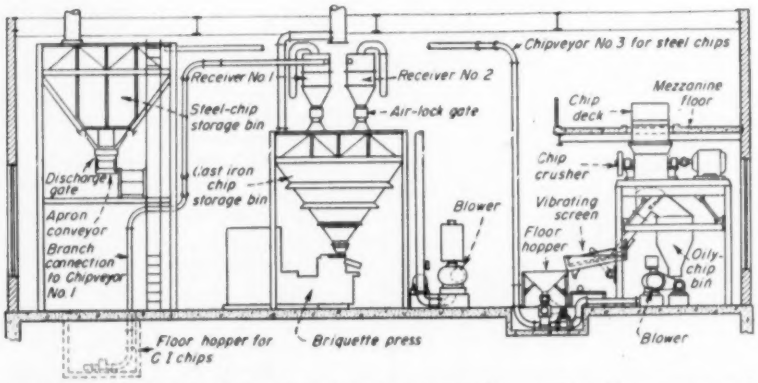
UNDERFLOOR HOPPER is fed by drag-chain conveyor working from head end of Champion cylinder-block machining line. Conveyor raises chips from pit under machine; then chip-handling operator shovels overflow and scattered chips into hopper grate. Other underfloor hoppers are filled from wheelbarrows



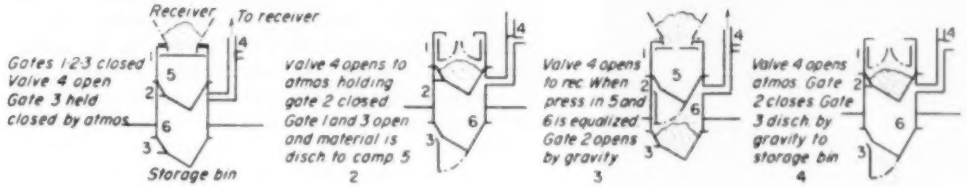
CHIPVEYOR NO. 1

CHIP HOUSE

TWO CHIPVEYORS draw dry CI chips from seven underfloor storage hoppers to the chip house. Branch lines lift chips about 20 ft from hoppers to main overhead vacuum lines



CHIP HOUSE (at far left of plant layout) contains storage bins, crusher, chip extractor, and briquetting press that will handle 65 tons of CI and 50 tons of steel chips daily. Installation was designed by Studebaker engineers and National Conveyor Co, Inc, for Studebaker's South Bend machine shop

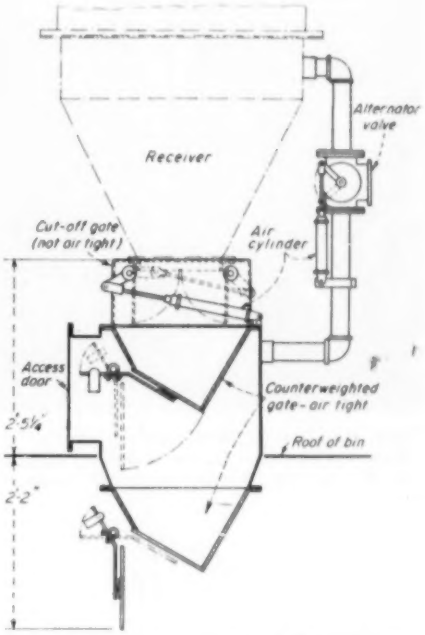


repeating the cycles continuously. Sequence is controlled by an interval timer at the panel in the chip house.

Chips are drawn through the 5-in. branch risers and the two main 6-in. conveyors to receivers and bag-type dry-air filters on top of the CI bin in the chip house. This eliminates any chance of dust blowing out into the shop, as would happen if a positive-pressure conveyor were used. Automatic airlocks drop the chips from the receivers to the storage bin, which will hold a day's production of chips (on basis of two 8-hr shifts). At a ratio of 130—140 lb per cu ft, this amounts to almost 65 tons of cast-iron chips.

There are some machines in the plant not convenient to any of the six feed stations; so chips from these units are trucked into the chip house by means of trailer-mounted bins and are dumped into the seventh feed box in the chip house. From there the dry CI is added to the storage hopper above the briquetting press.

Special false-bottom trucks are used to carry in wet CI chips and to let them drain. Then these chips, too, are added to the storage bin and are processed along with the rest of the CI chips.

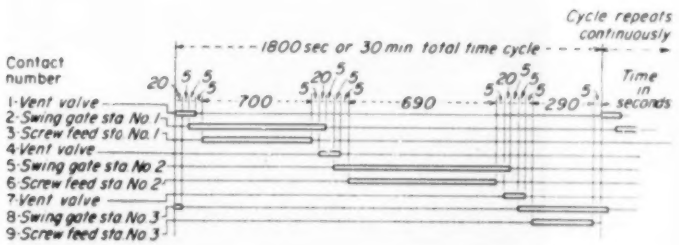


THREE-DOOR AIR LOCK (patented by National Conveyors Co, Inc) delivers dry CI chips from vacuum-line receiver to chip-storage bin in chip house. Lock operates automatically (see above, left) under control of alternator valve and air cylinder

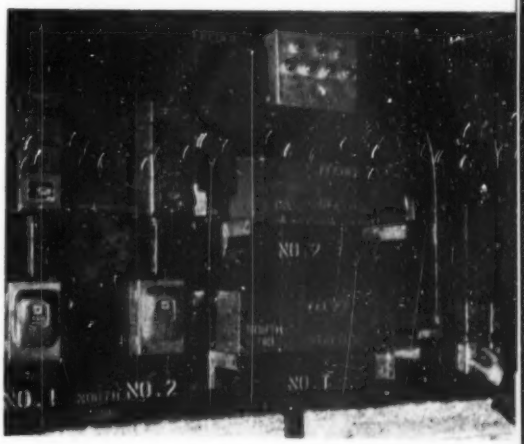
SALVAGING CAST IRON

Gravity feeds the CI chips from the hopper to the loading tray of a No. 350-BL Milwaukee briquetting press under the bin. One rack-and-pinion gate passes chips to the press, and another allows dropping chips directly outside the chip house into a railroad car on a spur track when the chips are to be shipped out in loose condition. A helicoid screw conveyor moves the loose chips through the chip-house wall, and a chute delivers to the gondola car.

Normally all CI is compacted into 4-in., 80%-density briquettes that range in length from 2½ to 3½ in. The variation is

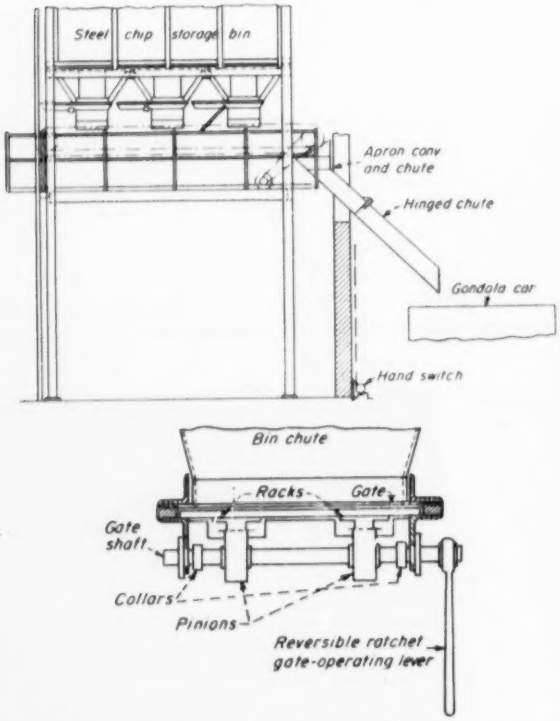


Graph of program timer for Chipveyor No 2



SWITCHBOARD IN CHIP HOUSE (far left of layout) has program timers for both vacuum conveyors; one controlling three stations, the other four, in adjustable sequence. Cycle is set up on cams; then cams actuate mercury switches that control stations in repeating cycles. Signal lights above timers indicate when each feed station is working. Timing for each station is adjustable

CRUSHER DISCHARGES STEEL CHIPS to vibrating screen or to centrifuge at right; either equipment removes coolant. Next, all chips are blown by short pneumatic conveyor to storage bin at other end of chip house



THREE DISCHARGE GATES in bottom of steel-chip bin drop chips to apron conveyor that delivers them to chute outside chip house. Gates are controlled by reversible ratchet levers that turn a pinion shaft

due to chip size, which controls the degree of compacting possible. The 350-ton press is driven by two 50-hp motors that will operate it at up to 12 strokes per min, delivering 3½ tons of briquettes per hr.

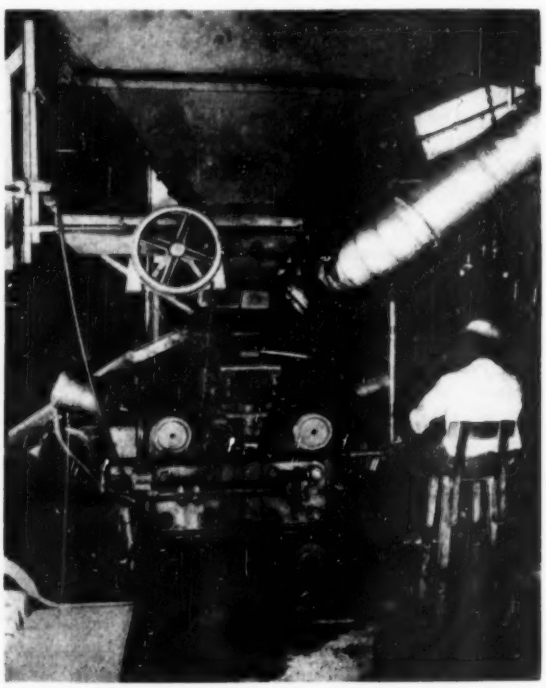
Graphite is added to each briquette to permit closer control of free-carbon content of castings in the company foundry than is possible with ladle inoculation. A Syntron vibrator on the graphite hopper assures even flow of the material into the press as cast-iron chips are loaded for briquetting.

A second setup may evenutally be added to the chip house for handling more cast iron, and for this reason extra space has been provided. There is also room for extending the conveyors to serve the future storage bin and press; conveyor design also allows for future additions of feed stations, if required.

STEEL CHIPS

Tractor-drawn trailers with 45-cu-ft-capacity bins bring steel chips from the machines to the chip house. Major problems are keeping chips covered with water-soluble coolants separated from those with oil, and keeping out bar-stock ends, scrap parts, and other material that might damage the crusher.

When enough bin loads of chips have accumulated in the chip house, they are dumped onto one of the chip decks on the mezzanine floor and fed to the No. 3800 American crusher. After crushing, the chips are discharged through a two-branch chute that sends them either to an oily-chip storage bin or to a vibrating screen where soluble-coolant chips



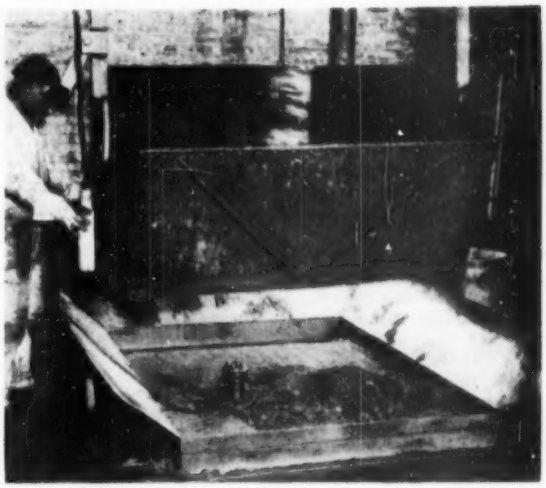
DRY CI CHIPS brought in by trailer train are dumped into conveyor feed station right in chip house. Air vibrator prevents chip bridging

are dried. The chute is operated by an air cylinder and solenoid valve to direct the chips to the proper destination.

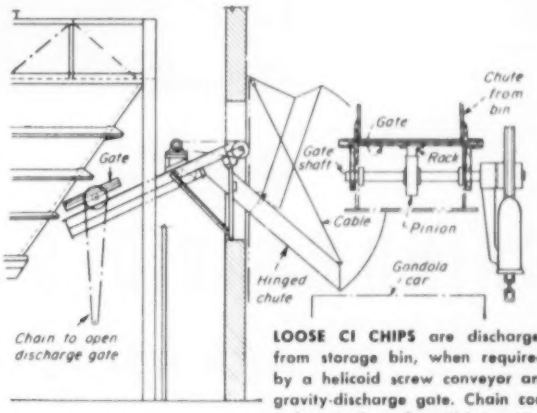
Oily chips are discharged from their bin to the basket for a 48-in. Tolhurst centrifugal oil extractor that wrings out reclaimable oil. Past this point, all steel chips are merged in a floor hopper. From here they are conveyed by screw and rotary feeder to a National Chipveyor that moves them across the chip house to a final storage bin, from which they can be dumped into a railroad car outside the chip house.

Water-soluble coolant drained from steel chips is pumped to sewer lines at present, but future plans call for processing it for reclamation. Cutting oil, however, is reclaimed now. It is pumped from the centrifuge extractor 300 ft underground to a nearby storage house. A 3400-gallon settling and steam-treating tank, a DeLaval centrifuge, and a laboratory-controlled makeup tank put this oil back into service. Savings obtained from this reclamation can be realized by comparing the return from discarded oil—$0.03 per gal.—against cost of new oil—$0.32 per gal. About 80% of the 40 gallons of oil reclaimed from each ton of steel chips can be put back into service this way.

Crushed steel chips and briquetted cast-iron chips bring a premium market price in the scrap markets, and they also permit filling gondola cars to capacity —assuring the best freight rates. Savings realized from the new system have proven the equipment a worthwhile investment.

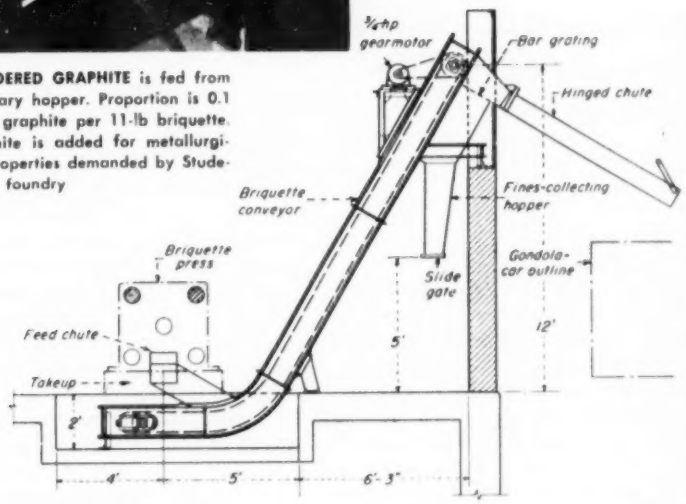


DRY CI CHIPS go through this process in the chip house: Storage bin feeds down chips to Milwaukee briquetter through rack-and-pinion gate. Briquettes are pressed with graphite



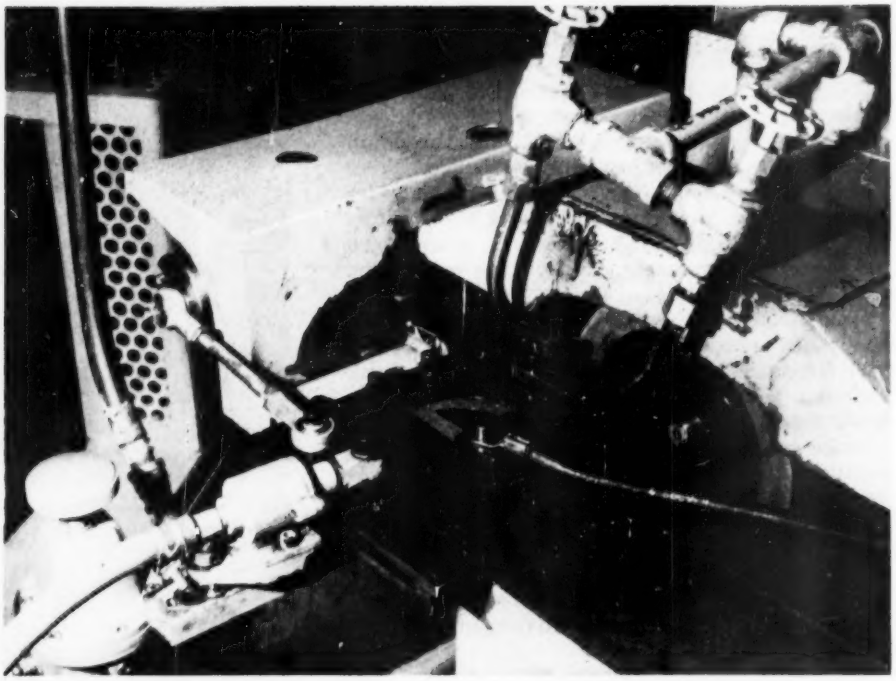
LOOSE CI CHIPS are discharged from storage bin, when required, by a helicoid screw conveyor and gravity-discharge gate. Chain controls gate from floor if briquetting is to be bypassed

POWDERED GRAPHITE is fed from auxiliary hopper. Proportion is 0.1 lb of graphite per 11-lb briquette. Graphite is added for metallurgical properties demanded by Studebaker foundry



FLIGHT CONVEYOR pushes briquettes up to opening in chip-house wall. Then briquettes roll down to . . .

RAILROAD GONDOLA CARS by gravity chute. Usually two cars are loaded daily



THE ELECTROLYTIC GRINDING operation showing the ball bearing fixture, air cylinder, variable speed drive, and dual nozzles for electrolyte solution

How To

GRIND CARBIDES SIX TIMES AS FAST

with less than 1% diamond wheel wear

Electrolytically assisted grinding of carbides, although relatively new, shows promise of replacing the conventional form of grinding (*AM*—Nov 10 '52, p 154). Now, tests indicate this can be accomplished on a sound practical basis with standard equipment and diamond wheels

BY JOHN A MUELLER, Manager, Mechanical Lab Dept
Sales Engrg Branch, CARBORUNDUM COMPANY

Test results at Carborundum established that:

1—Electrolytically assisted grinding with metal-bonded diamond wheels, as compared to conventional grinding with resinoid-bonded diamond wheels, provides a method of grinding cemented carbide that is as fast, or faster, and uses only a fraction as many diamonds.

2—It produces tools whose microinch finishes are as good as those of conventionally ground tools, and whose edges are equally as sharp, provided they are not subjected to the electrolytic action for a prolonged period.

3—Electrolysis will generate a dull appearance on carbide, which can be eliminated by varying the technique of finishing the carbide in the last few seconds of grinding.

4—It consumes substantially less spindle power in grinding carbides, but the power required for electrolytic assistance raises total power consumed to approximately 2½ times that used in conventional grinding.

To obtain a measure of the practicability of the electrolytically assisted grinding process, the following objectives were established:

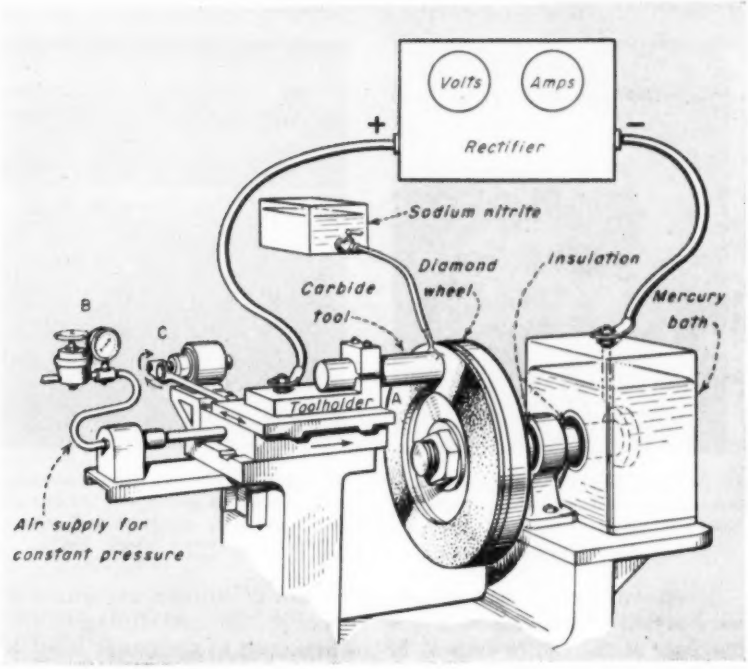
(1) To determine how fast cemented carbides can be ground.

(2) To determine whether diamond bort can be conserved.

(3) To determine the effect of the process on surface roughness, quality of the cutting edge and appearance of the ground carbide.

(4) To determine the amount of power consumed.

Our tests were directed toward



GENERAL ARRANGEMENT of electrolytic grinding test setup. Diamond grinding wheel is exaggerated in size to illustrate more clearly the relationship of the diamond bort to the electrolytically assisted process

the grinding of single-point tungsten-carbide tools, and consisted of holding the tool against a diamond wheel, with offhand pressure, and simultaneously traversing the tool across the wheel face. Work pressure, traverse speed, and wheel speed were the same as are generally used in tool grinding. Carboloy Grade 78B carbide was used as it is relatively difficult to grind.

Principal features of the arrangement include a Hammond electrolytic carbide tool grinder, a selenium rectifier, and a wattmeter.

Constant pressure was supplied to the workpiece at all times by a fixture mounted on the table of the tool grinder. The fixture, A, consists of an air cylinder that pushes against a set of ball-bearing ways and simultaneously reciprocates back and forth on another set of ball-bearing ways. To prevent electrolytic action on the constant-pressure device, the electrical ground was placed directly on the tool holder. This minimized wear on the ball bearings and kept them from pitting.

Infeed motion was controlled by a pressure regulator, B, that could be set at any arbitrary pressure. Traverse motion was controlled by a variable-speed drive, C.

Power was brought to the grinding machine through a mercury bath and a metal disk mounted on the insulated wheel spindle. Voltage was varied to maintain as high a current density as possible without excessive workpiece sparking.

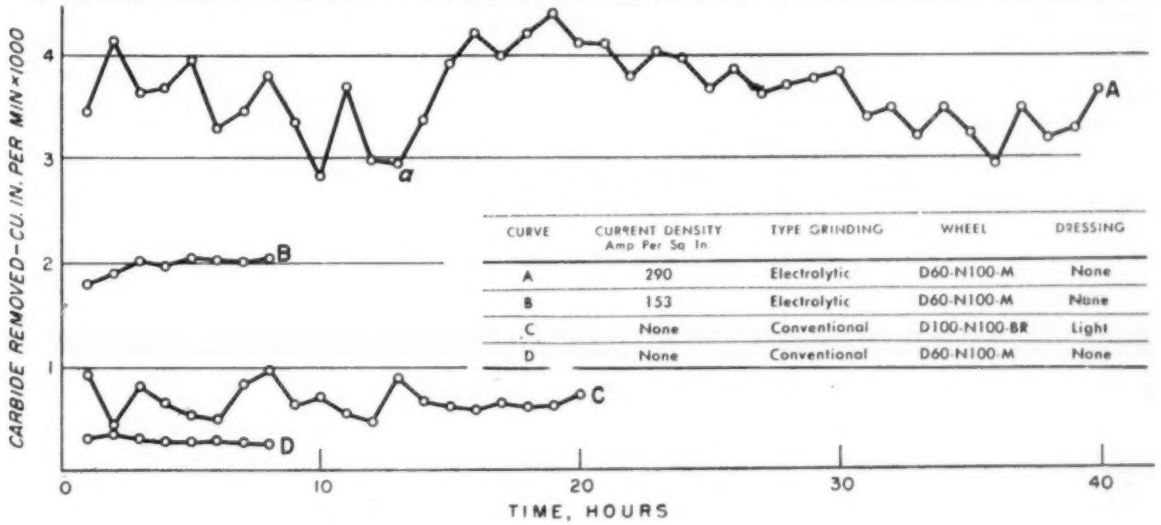
The rectifier circuit included a dc ammeter, a dc voltmeter and an ac ammeter. The ac ammeter served only as an indicator of sparking. At times, when there was no sparking visible, the ac ammeter would fluctuate and indicate the presence of sparking.

DISCUSSION OF RESULTS

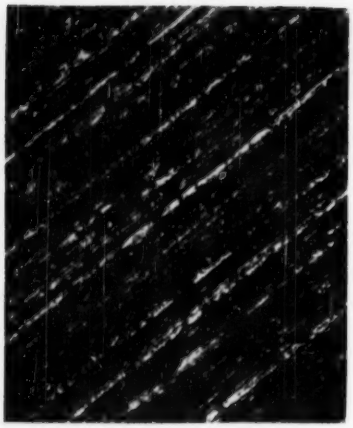
The effect of current on cutting rate is apparent by comparing curves A and B. By doubling current density—from 153 amp per sq in. to 290—the cutting is increased by about 1¾ times.

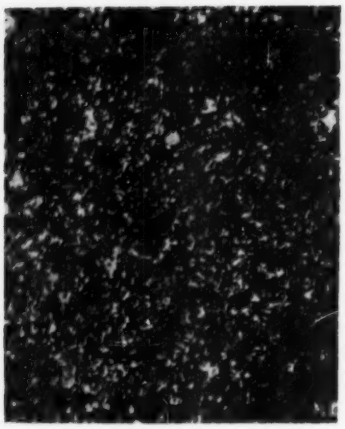
The assist given a metal-bonded diamond wheel by the electrolytic method is evident from the rela-

CARBIDE REMOVAL RATES OF ELECTROLYTIC GRINDING VS CONVENTIONAL GRINDING

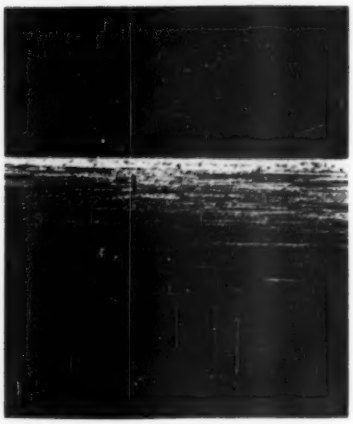


CURVE	CURRENT DENSITY Amp Per Sq In.	TYPE GRINDING	WHEEL	DRESSING
A	290	Electrolytic	D60-N100-M	None
B	153	Electrolytic	D60-N100-M	None
C	None	Conventional	D100-N100-BR	Light
D	None	Conventional	D60-N100-M	None





SURFACE CONDITION of a tungsten-carbide tool ground conventionally with a resinoid-bond diamond wheel. (A) Note pronounced scratch pattern of diamonds. (B) With 290 amp per sq in., electrolytic assistance for ½ hr. 500X



TYPICAL EDGE of many square-nose tungsten-carbide tools ground with 290 amp per sq in. electrolytic assistance and using a D60-N100-M diamond wheel. 20X

tionship of curve D with curves A and B. A current density of 153 amp per sq in. (curve B) increases cutting rate sevenfold, while 290 amp per sq in. (curve A) increases it by approximately 12 times.

Compared to conventional grinding with resinoid-bond diamond wheel (curve C), the electrolytically assisted process doubles the cutting rate when 153 amp per sq in. is used, and increases the cutting rate by 6 times when the higher current density is employed.

The high current-density test (curve A) was continued for 40 hr in order to obtain a measurable amount of wheel wear, while the other tests were run only as long as necessary to arrive at reliable comparative data.

SURFACE ROUGHNESS AND APPEARANCE

Table II shows a comparison of the surface roughness of tools ground under the four conditions.

These values were obtained with the carbide held against the grinding wheel at a constant pressure.

Surface roughness measurements were obtained by means of a profilometer at the end of each ½ hr of grinding.

EDGE EROSION

The tool illustrated in the photomicrograph was ⅛ x ½ in. and required less than 1 min to grind. Rate of carbide removed was 0.0036 cu in. per min., and the surface finish produced was 5 to 7 mu in. rms.

It is apparent that no edge erosion occurred under these grinding conditions. During the regular experimental tests, however, when the carbide blanks were ground for ½ hr at a time, the tools showed a definite erosion at the edge of the tool.

However, edge erosion is a function of grinding time. With a short grinding time, edge erosion is avoided.

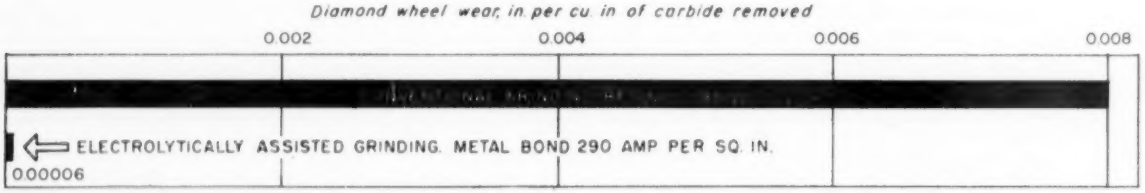
POWER

The amount of power consumed in grinding is an indication of grinding wheel action, and reflects freedom of cut and uniformity of wheel performance during its life.

Inasmuch as the power input to the spindle motor was only half that required for conventional grinding, it is evident that in electrolytic grinding the grinding wheel is free cutting and is not forced beyond its capacity.

The latter observation is particularly true, since in over-all performance, the electrically assisted grinding wheel performed considerably more work—in terms of amount of carbide removed and cutting rate—with substantially less power than conventional grinding.

In addition to the power requirements of the grinding wheel spindle, however, the electrolytic process also needs power to assist the wheel in the grinding operation. To supply a current density of 290 amp per sq in., 0.84 hp was required. This brings the total power consumed to 0.98 hp which is approximately 2½ times the power that is required in conventional grinding. (See Table II)



COMPARISON OF DIAMOND-WHEEL wear when grinding tungsten carbide under identical conditions of test. The metal-bond electrolytically assisted diamond-wheel shows a wheel wear of 0.00006 in. per cu in. of carbide removed. This is less than 1% of that obtained with the resinoid-bond wheel, which showed a wheel wear of 0.008 in. per cu in. of carbide removed

TABLE II

	ELECTROLYTIC METAL BOND D60-N100-M		CONVENTIONAL RESINOID BOND D100-N100-BR	CONVENTIONAL METAL BOND D60-N100-N
Current Density—amp per sq in.	290	153	None	None
Curve	A	B	C	D
Time of Test—hr	40	8	20	8
Total Carbide Removed—cu in.	8.614	0.936	0.805	0.143
Avg Cutting Rate—cu in. per min. X 1000	3.58	1.94	0.67	0.29
Avg Surface Roughness—mu in. rms	14	11	6.0	6.0
Power Consumed in Grinding—hp	0.14	0.20	0.40	0.40
Power Consumed for Electrolytic Asst—hp	0.84			
Total Power Consumed—hp	0.98		0.40	0.40
Wheel Wear per cu in. Carbide Removed—in.	0.00006		0.008	

Equipment: Model X 266 Hammond electrolytic carbide tool grinder. Model 75C selenium rectifier—Input wired for 440 V, 60 cycle, 3 phase, output 0-18V, 75 amp, dc. Spindle speed 2600 rpm; wheel speed 4084 sfpm; wheel size 6x¾x1¼ in., Metal-bond Type DS 20080. Contact pressure 43 psi. Traverse 30 cycles per min. Length of stroke 25/32 in. Electrolyte 5% solution sodium nitrite.

SPACING BETWEEN WORKPIECE AND WHEEL

Consideration was given to the distance between the grinding wheel bond and workpiece (ie, the protrusion of diamonds from the bond). Too great a spacing will obviate the electrolytic effect, and too small a spacing may increase current density beyond a usable range and may cause shorting of the electrical circuit.

Space measurements were made on a polarizing microscope, using oblique illumination to determine the distance the diamonds protruded from the bond. The difference in elevation of the diamond was measured by focusing on the upper surface of the diamond and also on the adjacent surface of the matrix, and reading the distance between them.

This method is not precise because it is not always possible to focus directly on the top of the diamond. It did, however, permit an evaluation of the need for a definite spacing between the workpiece and wheel.

The average mean protrusion of the diamonds, based on 15 readings taken on the outer periphery of a wheel and 15 readings taken on the inner periphery, was 0.0023 in.

The significance is conclusive, that a metal bond diamond wheel, manufactured under current commercial production conditions, produces a substantial electrolytic assist.

ELECTROLYTE

A 5% solution of sodium nitrite in water was found to be most satisfactory for electrolytic grinding. It was applied at the point of contact between grinding wheel and workpiece, at the rate of 1 gal. every 2½ min. A distinct advantage of the sodium-nitrite solution is that it minimizes corrosion.

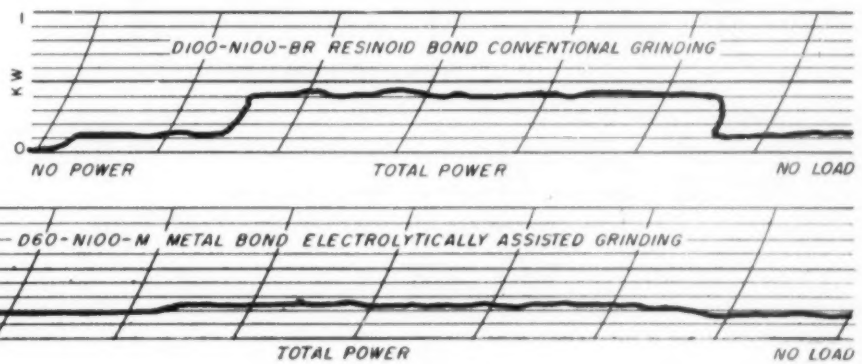
The solution performed well for 13½ hr of grinding, although it became progressively contaminated and filled the wheel with a soft deposit. This filling caused the cutting rate to decrease, as evidenced by the drop-off in curve A. Brushing the wheel with a stiff scrubbing brush after 13½ hr restored the cutting rate to its original value and did not consume any diamonds (see point "a" on curve A).

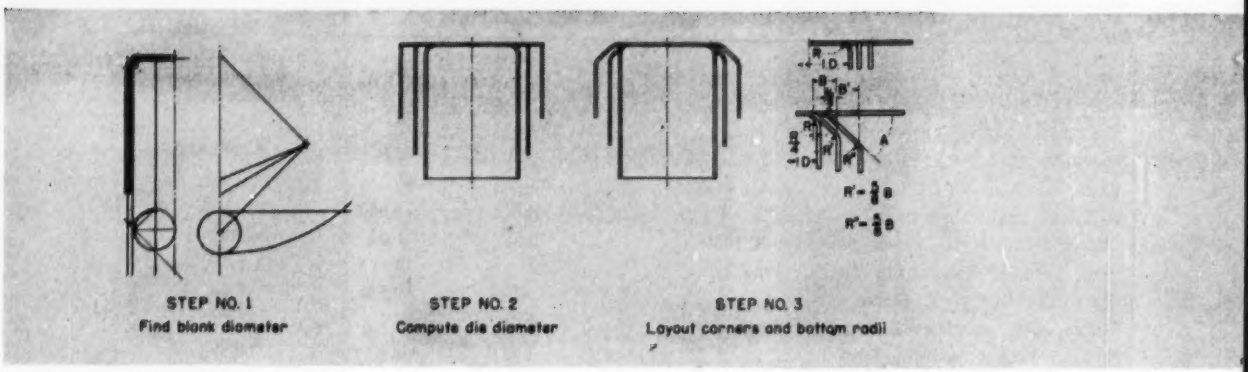
NON-DIAMOND WHEELS

The use of non-diamond grinding wheels for electrolytic grinding was also explored.

Preliminary studies were conducted with aluminum oxide and silicon carbide grain in 16 grit and 60 grit. The initial tests were not successful. It is intended to continue this investigation with grinding wheels made under different manufacturing techniques.

TYPICAL POWER CHARTS OF SPINDLE-MOTOR INPUT





Cope Talks on Draw Dies ... V

LAYOUT OF DEEP-DRAWN SHELLS

After finding the blank diameter, the number of draws is computed by one of two methods presented. Then the die designer must consider the radii or angles of corners and the heights of the preliminary shells

Shells can be reduced in diameter from 8% to 30%, depending on thickness and kind of metal involved, the number of times the shell has been previously drawn, and the type of die and press used.

Shells may be redrawn as many times as desired, provided that the original grain structure is restored after every two or three draws by means of interstage annealing. During drawing, the metal strain-hardens and changes from the annealed to a harder temper. Therefore the rate of reduction (per draw) in each successive draw must be decreased in proportion.

The maximum amount a drawn shell can be reduced in one operation can be computed by either the percentage system or the constant system.

Percentage reductions for first-operation drawing dies, and, for

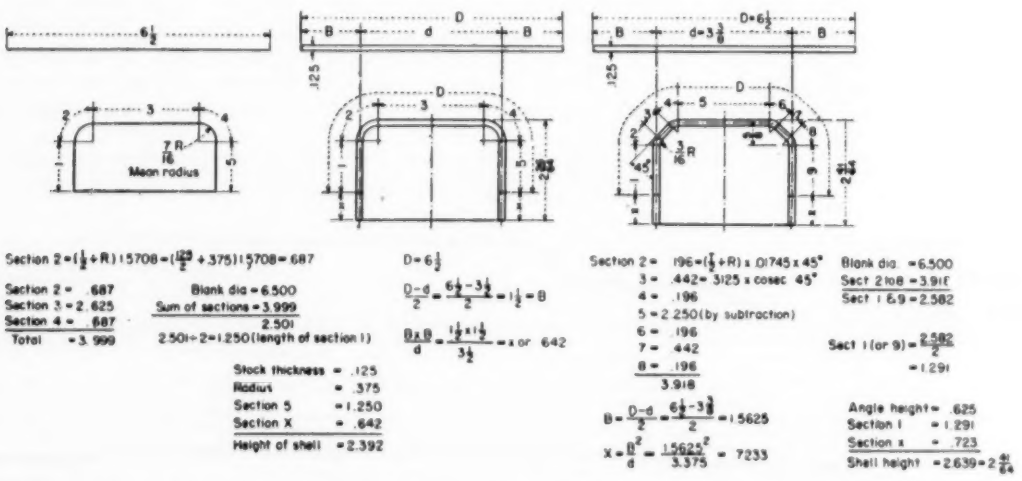

Mean radius
Section 2 = (1/2 + R) 1.5708 = (1 3/32 + .375) 1.5708 = 6.87
Section 2 = .687
Section 3 = 2.625
Section 4 = .687
Total = 3.999
Blank dia = 6.500
Sum of sections = 3.999
2.501
2.501 ÷ 2 = 1.250 (length of section 1)
Stock thickness = .125
Radius = .375
Section 5 = 1.250
Section X = .642
Height of shell = 2.392
D = 6 1/2
(D - d)/2 = (6 1/2 - 3 1/2)/2 = 1 1/2 = B
B x B / d = 1 1/2 x 1 1/2 / 3 1/2 = x or .642
Section 2 = .196 = (1/2 + R) x .0175 x 45°
3 = .442 = .3125 x cosec 45°
4 = .196
5 = 2.250 (by subtraction)
6 = .196
7 = .442
8 = .196
3.918
B = (D - d)/2 = (6 1/2 - 3 3/8)/2 = 1.5625
x = B²/d = 1.5625²/3.375 = .7233
Blank dia = 6.500
Sect 2 to 8 = 3.918
Sect 1 to 9 = 2.582
Sect 1 (or 9) = 2.582/2 = 1.291
Angle height = .625
Section 1 = 1.291
Section x = .723
Shell height = 2.639 = 2 41/64

FIG. 2 . . . Heights of the various preliminary shells in a series are computed, in order to layout the dies

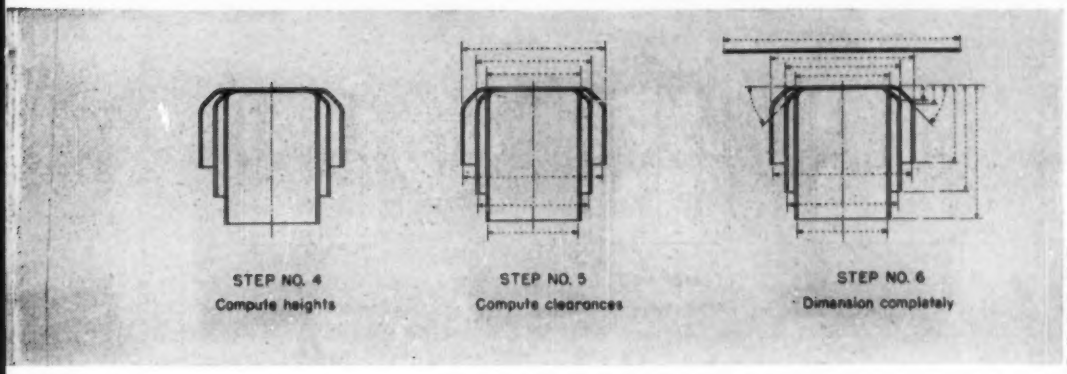


FIG. 1 . . . Operation layouts for deep-drawn shells not only determine the number of steps to make them, but minimize oversights and mistakes

FOLLOWS CERTAIN STEPS

BY STANLEY R COPE, President
ACME SCHOOL
OF DIE DESIGN ENGINEERING

successive redrawing dies, are tabulated for several metals.

Example: Assume that we wish to find the number of operations and the diameter of the shell at each stage required to draw a stamping 3½ in. dia by 4 7/16 in. deep. The blank diameter is 8¾ in. and the shell is to be drawn from 0.060 in. deep-drawing steel. According to the tables, a steel blank 0.060 in. thick can be reduced 40% in the first drawing operation, or it can be drawn into a shell which has a mean diameter equal to 60% of the diameter of the blank. With D representing the blank diameter, and d the mean diameter of the first shell, we have: $d = 0.6 \times D = 0.6 \times 8.75 = 5.25$ in.

The first shell can be reduced 20% in the first redrawing operation, or

$$d_1 = 0.8 \times d = 0.8 \times 5.25 = 4.20 \text{ in.}$$

The second shell can be reduced 18% or:

$$d_2 = 0.82 \times d_1 = 0.82 \times 4.20 = 3.44 \text{ in.}$$

Thus, three operations are required to draw the stamping. The OD of each shell can be found by adding one thickness of stock to each of the computed diameters or:

$$5.25 + 0.060 = 5.31$$
$$4.20 + 0.060 = 4.26$$
$$3.44 + 0.060 = 3.50$$

To use even figures in designing dies, the first shell should be 5¼ in. dia; the second shell, 4¼ in. dia.

THE CONSTANT SYSTEM

When shells are to be drawn from soft drawing steel, tinplate, brass or copper in hydraulic or double-action presses, or in single-action presses equipped with collar-type redrawing dies and air cushions, the constant system of computing diameter reduction may be used. This system was explained instalment II (*AM*—Aug. 17, p 106). The same constants are repeated here, for finding the diameter to which the first shell can be drawn from a flat blank. In addition, constants are given for redrawing operations.

The formulas for computing the diameters of a series of shells are:

$$d = \frac{K \times D}{100 - (0.635 \times D)}$$

$$d_1 = \frac{K_1 \times d}{100 - (0.635 \times d)}$$

$$d_2 = \frac{K_1 \times d_1}{100 - (0.635 \times d_1)}$$

$$d_3 = \frac{K_1 \times d_2}{100 - (0.635 \times d_2)}$$

To illustrate the use of the formulas, let us compute the number of operations and the diameters of the various shells for drawing a stamping 3 5/32 in. dia by 5⅜ in. deep. The blank diameter is 8¾ in. and the shell is to be drawn from 0.028-in. deep-drawing steel. The table shows that the constant K for 0.028 in. metal is 57. Then

$$d = \frac{57 \times 8.75}{100 - (0.635 \times 8.75)} = 5.28 \text{ in.}$$

The diameter of the second shell can be found by inserting the constant K_1 or 75, and the diameter of the first shell in the formula, or:

$$d_1 = \frac{75 \times 5.28}{100 - (0.635 \times 5.28)} = 4.097 \text{ in.}$$

The diameter of the third shell can be found by inserting the constant K_1 and the diameter of the second shell in the formula, or:

$$d_2 = \frac{75 \times 4.097}{100 - (0.635 \times 4.097)} = 3.155$$

The outside diameter of each preliminary shell can then be found by adding one thickness of stock to each of the computed diameters.

OPERATION LAYOUTS

An operation layout is made for all deep shells in order to determine the number of operations re-

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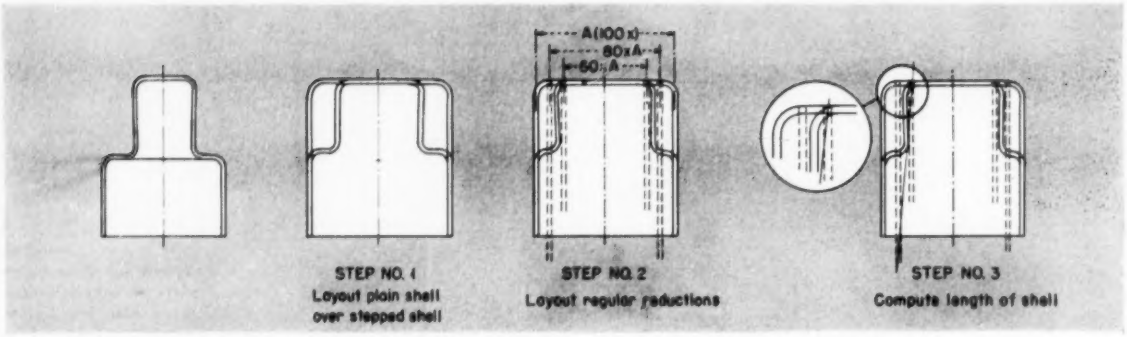


FIG. 3 . . . By three steps, the die designer can determine if a stepped shell can be redrawn in one operation. If the stepped portion is outside the diagonal line, step 3, it can be redrawn in one operation

quired to produce them, as well as to determine the shape and size to which it is necessary to draw each preliminary shell before the final shell can be made. Six steps are necessary in the preparation of an operation layout. Each of these steps is shown in Fig. 1. In the first step the trimming stock is added to the shell, and the diameter of the blank is found by the graphical method (*AM*—August 17, p 106). In the second step the number of drawing operations and the diameter of each shell are found either by the percentage or the constant systems, depending upon the thickness of stock, the kind of material and the type of die used.

In the third step the corners in the bottom of the preliminary shells are either rounded, or are made angular, depending upon the thickness of stock and the amount the shell is reduced. If the reduction in diameter is very small, or the stock is very thick, the corners are rounded. If the reduction in diameter is appreciable, or the stock is comparatively thin, angular corners should be used in order to make the metal flow properly.

There are no hard and fast rules as to how large the bottom radii of preliminary shells should be, except that the radius of each shell should be proportionately larger than that of the succeeding shell.

When shells are prepared with angular corners, angle *A*, Step 3, should measure 30° from the horizontal for stock up to 1/32 in. thick, 40° for stock ranging from 1/32 in. to 1/16 in. thick, and 45° for stock 1/16 inch thick and over.

The size of the corner angles for preliminary shells depend upon the bottom radius of the finished shell and the amount each shell is reduced in diameter. The angle in the bottom of the last preliminary shell should start at a point equal to one-quarter of the length of the bottom radius of the finished shell, measured inward from the inside wall of the shell. Angles for all other shells should start at a point which lies in the center of the *B* dimension of the succeeding shell. Radius *R* at the bottom of the shell should be approximately five-eighths of the length of the B dimension.

In the fourth step the heights of the preliminary shells are computed. The length of the straight portion of a plain round shell, Fig. 2, can be found by subtracting the combined lengths of sections 2, 3 and 4 from the blank diameter, and dividing this difference by two, then adding distance *X*. Distance *X* is found by squaring one-half the difference between mean diameter of shell and blank diameter and dividing this number of mean diameter.

In the fifth step the clearances to be allowed between the drawing punches and dies are computed, and the layout is dimensioned. The difference between the diameters of the punch and the die for drawing plain steel, tinplate, copper and brass should be equal to 2.2*t* (2.2 times the stock thickness) for the first draw, 2.3*t* for all other preliminary draws, and 2*t* for the final draw if the shell must be held to

PERCENT REDUCTION IN DIAMETER FOR DRAWING

Thickness of Stock	First Draw		Second Draw		Third Draw		Fourth Draw	
	Desired	Max.	Desired	Max.	Desired	Max.	Desired	Max.
Brass and Copper								
1/16 & Less	44	50	24	30	22	24	20	22
1/16 to ⅛	44	50	18	24	16	18	14	16
⅛ to 3/16	44	50	15	18	14	15	13	14
3/16 to ¼	44	50	12	15	11	12	10	11
Over ¼	44	50	10	12	9	10	8	9
Plain Steel and Tinplate								
1/16 & Less	40	47	20	25	18	20	16	18
1/16 to ⅛	40	47	15	18	14	15	13	14
⅛ to 3/16	40	47	12	15	11	12	10	11
3/16 to ¼	40	47	10	12½	9	10	8	9
Over ¼	40	47	8	10	7	8	6	7
2S, 3S, and 52S Aluminum								
1/16 & Less	40	42	20	25	18	20	16	18
1/16 to ⅛	40	42	15	18	14	15	13	14
⅛ to 3/16	40	42	12	15	11	12	10	11
3/16 to ¼	40	42	10	12½	9	10	8	9
Over ¼	40	42	8	10	7	8	6	7

size. Aluminum and zinc require a space between the punch and the die of 2.2*t* for the first draw, 2.3*t* for the second draw, and 2.4*t* for the third and succeeding draws. Aluminum shells should not be sized or ironed in the last drawing operation. If the diameter of the shell must be held to accurate size, or the shell must be perfectly straight and true, the shell should be sized in a separate operation.

In the sixth step the layout is completely dimensioned and the operations are listed.

CONSTANTS FOR DRAWING AND REDRAWING

Thickness of Stock	FIRST OPERATION DIE K	ALL REDRAWING DIES K_1
	Soft Drawing Steel Tinplate Brass & Copper	Soft Drawing Steel Tinplate Brass & Copper
0.016 to 0.018	64.5	77.5
0.020	61.5	76.5
0.022 to 0.024	59.5	76
0.028	57	75
0.030	53	73.75
0.060	50	72.5
0.120	51	65

STEPPED DRAWING

The percentage tables and the constant system are based on drawing a shell straight off for its entire length. If a shell is stepped or only drawn part way off, as shown in Fig. 3, greater reductions can usually be made because the metal is under stress for a shorter period of time. The shell is first drawn to the largest diameter in the same manner used for drawing plain straight shells. One or more dies are then used to redraw a portion of the shell to each of the smaller diameters. The amount of reduction possible in one operation depends upon the height of the stepped portion of the shell. Stepped portions of a shell which are only drawn a short distance can be redrawn to a diameter equal to as little as 40% of the diameter of the shell (60% reduction).

Steps 1 to 3, Fig. 3 show how to determine whether a stepped portion of a shell can be drawn in one operation. An accurate layout of the plain straight shell, before it is reduced, is made and is superposed over the layout of the finished stepped shell, Step 1. Dotted lines are then drawn (Step 2) to represent the desired reduction for drawing the shell all the way off (taken from table) and also of twice the desired reduction. The height of the shell which represents the desired reduction is then computed and a diagonal line is drawn (Step 3) from the bottom of this shell to the top of the smaller shell. The line should be drawn from the center of the wall of each shell. If the stepped portion of the shell is outside this line the reduction can be made in one operation. If it is inside the line, two or more operations are required.

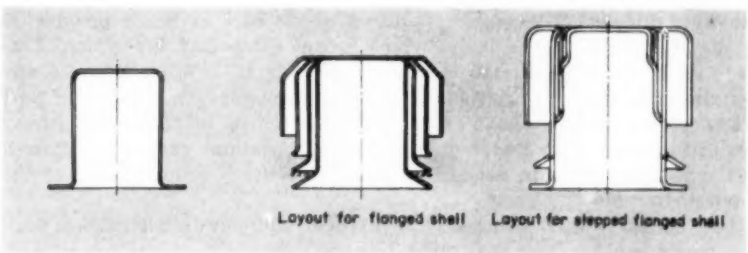
The shoulders of a stepped shell are usually drawn at a 30° angle with liberal radii.

FLANGED SHELLS

When a shell has a small flange, as shown in Fig. 4, the number of operations and the diameters of the various draws required are computed in the same manner as described for plain shells. Those preliminary shells which are larger in diameter than the flange are drawn straight off, while a flange is allowed to form on shells which are smaller than the flange (Fig. 5). The flange in the final drawing operation is drawn at an angle (preferably 30° from the horizontal) and is flattened in a separate die.

Stepped shells with small flanges are drawn as shown in Fig. 6. A plain shell is drawn straight off. This shell is then reduced to a flanged shell with a diameter equal to the largest diameter of the finished shell. The uppor portion of this shell is then redrawn in two separate redrawing dies to produce the smaller diameters. The angular shoulders and the flange are then flattened, and the radii are set in a final operation.

Part VI of Mr Cope's series will appear in an early number.

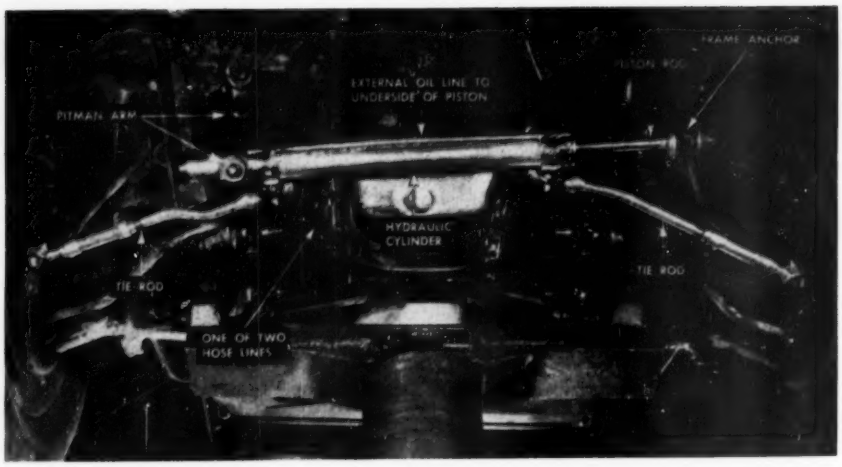


FIGS 4 AND 5 . . . To make a deep-drawn flanged shell, preliminary shells are drawn straight off until their diameter is less than the flange width. **FIG. 6** . . . Layout of a stepped flanged shell combines the methods for flanged and stepped shells

Forest in Spite of the Trees

QUITE OFTEN changes needed in aircraft product engineering are very modest—so apparent that we ask ourselves, "Why didn't we do it before?"

The story is told that James Clerk Maxwell, the famous British physicist, in a lecture on the invention of the telephone back in 1875 remarked that when the British scientists first heard of the device, they imagined it to be a very complicated, intricate instrument. And Maxwell said, "But when at last this little instrument appeared, consisting of parts which are all familiar to us, and capable of being put together by an amateur, the disappointment arising from its humble appearance was only partially relieved on finding that it was able to talk."—Mundy I Peale, President, Republic Aviation Corp, speaking in Detroit late in 1952.



POWER-STEERING MECHANISM attaches to both tie rods, with piston-rod end anchored to right side of automobile frame. Piston is double-acting; hydraulic oil is feed to right or left side by booster mechanism, depending on which way steering wheel is turned

Five powder parts for power steering

Wear resistance and economy were the reasons Monroe Auto Equipment Co, Monroe, Mich, picked powder-metal parts for its power-steering mechanism. Here are what the parts look like, how they are made by Michigan Powder Metal Products Co, Plymouth, Mich, and why they are made from compacted and sintered powder

BY CHARLES EMERSON, ASSOCIATE EDITOR

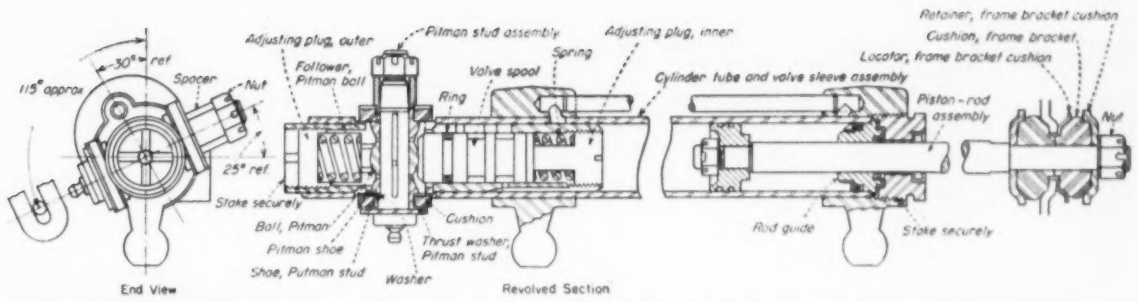
These five parts for the Monroe power-steering mechanism are produced completely from powdered iron far more economically than they could be made by conventional metalworking methods. Only one —the piston—is machined later; and that work is simply cutting two grooves in the OD. Compacting, or briquetting, dies have unusual features to meet strength and dimensional-accuracy requirements in the parts.

The die for the follower, for example, has a floating core rod that moves downward under pressure from the upper punch. This forms the internal section of the part, into which a spring is fitted during assembly. The floating action keeps the rod high during the die-filling operation; thus, just enough powder to fill to the required density in the thin top section of the follower is provided. Two core pins on top of the core rod produce oil holes in the product. The lower punch is set low during the fill operation, permitting enough powder to enter the die cavity for pressing the long outer wall.

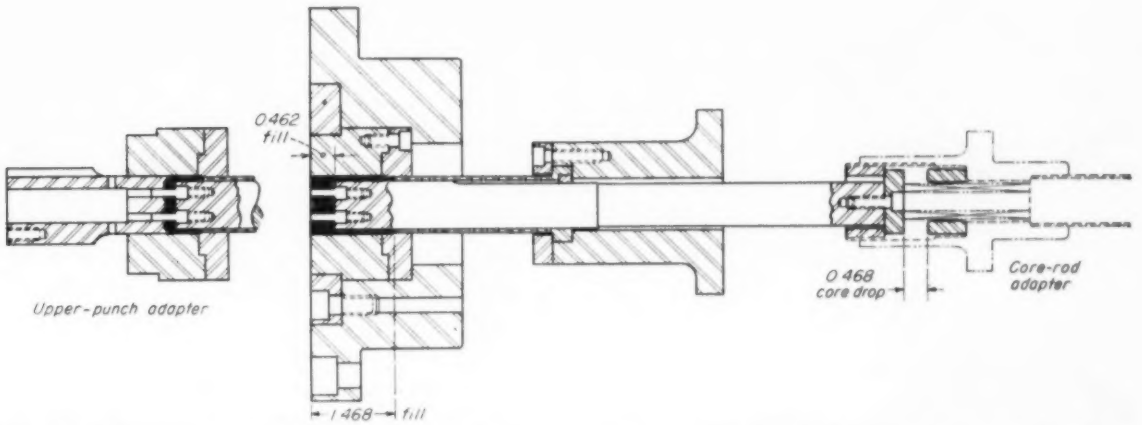
A recess in the face of the follower, which seats the ball, is formed by a raised boss on the face of the upper punch. This increases the density of the pressed briquette at that surface, because powder is not allowed to escape after the fill is made. More powder is thus forced into less space, which provides better wear resistance. The die set is made of HSS, ground and lapped to mirror finish on working surfaces, which permits production of nearly 700 pcs per hr.

Designing the die for producing pitman-shoe races presented more difficult problems than those encountered with the follower. The problem of providing exactly the right amount of powder for pressing non-uniform sections to the correct and uniform density was more acute. The flange, for example, required about half as much powder as the body, which meant compound die action. Emphasis on uniform density is justified, because any variations in density throughout a compacted part would cause wide differences in shrinkage during sintering. In addition, variations cannot be allowed in density because of accuracy requirements of the parts.

To meet this problem, an inner die section was built to float much like the core rod previously described. However, it moves down inside the die in a different manner. Two pins attached to the inner-die-section flange extend upward (outside the die cavity) and



MECHANISM DEPENDS MAINLY ON POWDER-METAL PARTS to take up operating wear. Rod guide (right end) keeps piston rod in alignment; O-ring grooves in piston itself are machined after sintering; pitman ball follower is formed with recess in external face to fit ball; race has close-tolerance rectangular bore in which pitman-shoe stud with flat sides fits

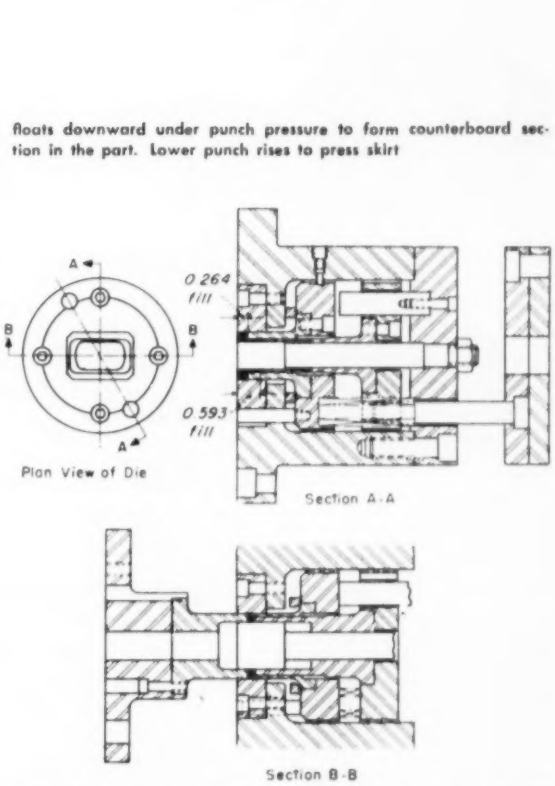


DIE FOR BALL FOLLOWER employs a floating core rod with two pins that form oil-passing holes (for lubrication and to equalize pressure). Punch has close-fitting clearance holes for core pins; rod floats downward under punch pressure to form counterboard section in the part. Lower punch rises to press skirt

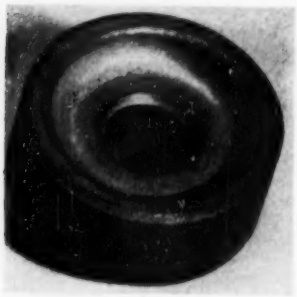
are flush with the top of the die adaptor. These are engaged by mating pins on the upper-punch assembly, which force them down as the punch lowers at the beginning of the pressure stroke. Springs under the die section compress, and later return the section to its fill position after the punch has left the die. Mechanical stops control the length of stroke in both directions. The lower die rises from its fill position simultaneously with the punch stroke to compact the work, then rises again after the punch rises to eject the piece.

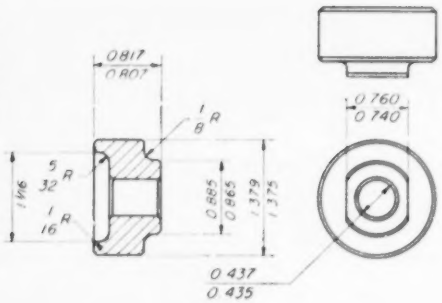
All members are rectangular in shape, including the stationary core pin which produces the hole in which the pitman stud rides in the power-steering assembly. Split die construction was avoided, despite the difficulties in making the die tools to sufficient accuracy for the job, to provide high strength for the great compacting pressures at fast production rates.

Apart from the obvious advantage of making complex shapes without wasting raw material, each of these five parts was made by powder metallurgy to gain the greater wear resistance than can be obtained in wrought parts. Normal porosity of the powder-metal parts retains oil, therefore provides excellent bearing surfaces.

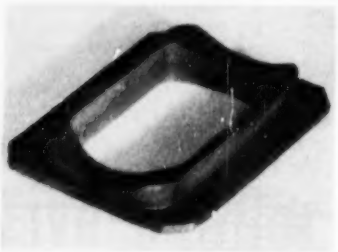


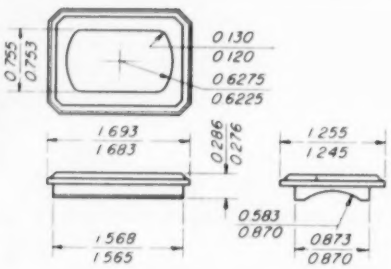
DIE FOR PITMAN-SHOE RACE has floating inner die; lower punch is situated lower in the die than the inner die when the set is open. When dieset closes, it rides up to final position as the inner die floats down. Combined actions produce uniform density throughout part, even though cross-sections vary



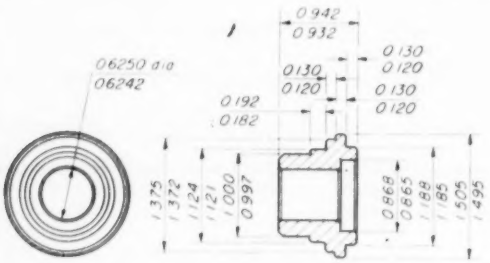


SINTERED-IRON PISTON retains oil in pores for high wear resistance in operation. Besides inherent wearing qualities, powder-metallurgy process eliminates machining flats on boss

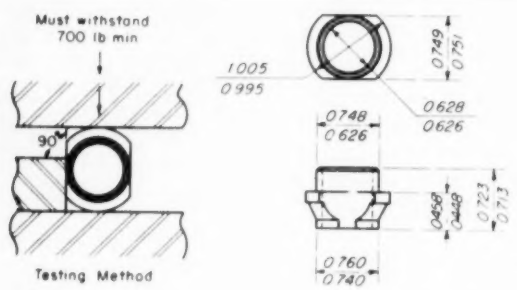




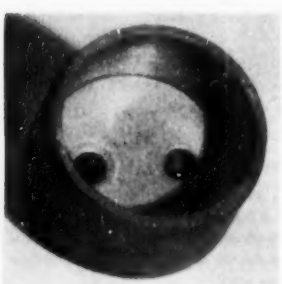
PITMAN-SHOE RACE is difficult shape for machining; but a simple one in powder metallurgy. Close tolerances and high strength are obtained by compacting in specially designed dies

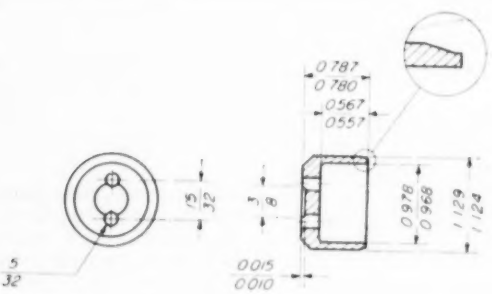


ROD GUIDE has multiple shoulders, which complicate pressing to uniform density. Tools are designed to distribute powder in correct proportions throughout the piece in briquetting operation



PITMAN-SHOE STUD requires dimensional accuracy and high wear resistance. This could be made in a screw machine, but compacting eliminates a milling operation that would otherwise be required. Iron powder also provides good bearing material





BALL FOLLOWER requires excessive density in the recess at the top, which gives extra strength for ball contact in the steering mechanism. High production rate on tools of special design keep costs low on this part

HIGH-RAKE MILLING

. . . a progress report

In the three years since our initial announcement of high-rake milling (AM — Apr 3, '50, p 122), additional experiments have been made and the process has been applied to a number of production operations with very favorable results. Typical studies, including research at General Electric on stainless and jet alloys, production tooth cutting on broaches at LaPointe, and high-helix milling tests on titanium alloys at Douglas Tool, are here combined in a progress report. Also, to provide the necessary theoretical basis for an understanding of the process, we have abstracted conclusions from an ASME paper by J H Crawford and M E Merchant of The Cincinnati Milling Machine Company. — *E J Tangerman*

HSS, with High Rake, Mills HSS

LaPointe cuts broach teeth and other shapes in M-2, M-1, 18-4-1, and 18-4-2; with cutters of M-2; at 126 sfpm

EXPERIMENTAL CUTTER (right) ground with 34° rake angle from a standard cutter (left), but otherwise conventional, has solved several difficult operations in machining stainless and other alloys

Stainless alloys in the 300 series, 61S and 52S aluminum and special alloys GE-B5F4B and chrome moly A151-4142 can be milled or tapped when normal rakes fail. Other applications appear promising except for single-point lathe tools

By A B DELORENZO
Foreman, Manufacturing
Guided Missiles Department
GENERAL ELECTRIC COMPANY

HIGH-RAKE CU

Defense production, as well as some civi tions, has called for extensive machini corrosion-resistant or stainless steels much more difficult to handle than co particularly the "300" series. Thus we h Guided Missiles Department, undertak sive development of the high-rake too Apr 3 '50, p 122; Jan 22 '51, p 321; Ma May 14, '51, p 174A; Nov 26 '51, p 125

While teeth on a conventional cutte with a rake angle of 4° to 10°, the hi has a rake angle of 34° with reference diameter. Primary and secondary clea are not changed, nor is the helix angle helical cutters.

Here are several examples indicatin of the high-rake tool:

MILLING 300 SERIES STAINLESS

300-series stainless when milled wit tional HSS staggered-tooth, side-milli 4½-in. dia by $^{9}/_{16}$-in. face on a horizo only 3 linear inches before it was dulle

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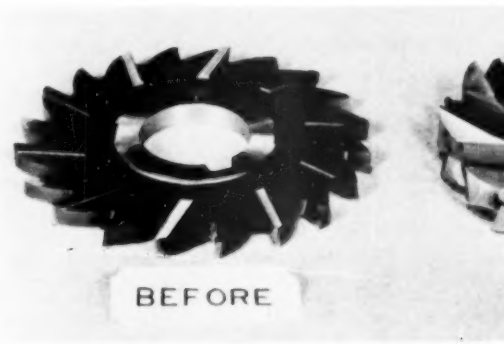
By CARROLL EDGAR, Carbide Engineer, THE LaPOINTE MA

We recently made a serious effort to mill high-speed steel faster, either (and preferably) with cemented carbides or, as a last resort, with high-speed steel. Carbide cutters of the latest mechanical recommendations, such as negative rake, failed. This was not because of faulty technique but because no carbide grade is as yet available which will successfully mill the chromium carbide (as such) in the HSS. That left us only one alternative—HSS itself for the cutter.

Having heard through various channels of the virtues of high-rake milling, we called upon Dr Frazer of Union Twist Drill for recommendations on such cutters for our job, which is not a novelty, but a daily "bread-and-butter" job involving tons of broaches in 18-4-1, 18-4-2, M-1, and M-2 steels.

With the M-2 cutter, 4 in. in diameter, and with 25°



EXPERIMENTAL CUTTER (right) ground with 34° rake angle from a standard cutter (left), but otherwise conventional, has solved several difficult operations in machining stainless and other alloys

HIGH-RAKE CUTTERS AND TAPS I

Stainless alloys in the 300 series, 61S and 52S aluminum and special alloys GE-B5F4B and chrome moly A151-4142 can be milled or tapped when normal rakes fail. Other applications appear promising except for single-point lathe tools

By A B DELORENZO
Foreman, Manufacturing
Guided Missiles Department
GENERAL ELECTRIC COMPANY

Defense production, as well as some civilian applications, has called for extensive machining of various corrosion-resistant or stainless steels. These are much more difficult to handle than common steels, particularly the "300" series. Thus we have, in GE's Guided Missiles Department, undertaken progressive development of the high-rake tool (See *AM* — Apr 3 '50, p 122; Jan 22 '51, p 321; Mar 5, '51, p 78; May 14, '51, p 174A; Nov 26 '51, p 125 — *Ed.*).

While teeth on a conventional cutter are ground with a rake angle of 4° to 10°, the high-rake tool has a rake angle of 34° with reference to the cutter diameter. Primary and secondary clearance angles are not changed, nor is the helix angle in the case of helical cutters.

Here are several examples indicating advantages of the high-rake tool:

MILLING 300 SERIES STAINLESS

300-series stainless when milled with a conventional HSS staggered-tooth, side-milling cutter of 4½-in. dia by $^{9}/_{16}$-in. face on a horizontal mill, cut only 3 linear inches before it was dulled and burned to useless condition. Speed was feed $1^{5}/_{16}$ ipm, and the cut ½ in.

A high-rake cutter of the same ating under the same condition performance. Feed was then increa to 110 rpm (123 fpm) and depth difficulty was encountered even rake cutter was removing over 88 the same time. The new cutters operation long enough to compa rately, but the indications are tha to 20 times longer than with con production per unit of time almo

ALUMINUM 61S AND 52S

Tested on aluminum 61S and 5 milling cutter gave excellent pe rpm (1118 fpm) with 63 ipm feed of cut. Even with feed of 90 ipm rapid traverse) and depth of cut showed no wear and did not heat a cut made dry the cutter can b bare hand. Capacity of the cutte

OINTE MACHINE TOOL COMPANY

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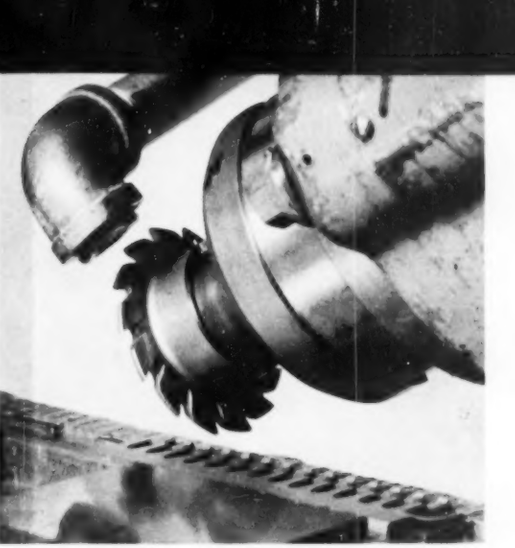
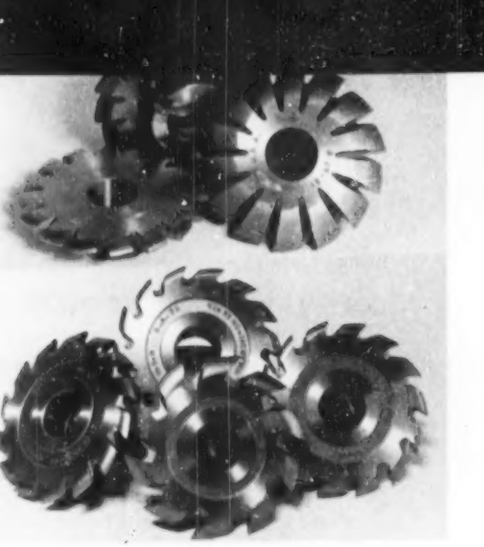
rake teeth, we have been able to increase surface speed from 77 to 126 sfpm, feed from 4½ to 7¾ ipm over conventional 0° rake HSS cutters. Thus speed has been increased almost two-thirds, feed 73%. First tests indicate that the high-rake tool need be ground only 0.008 in. on the face to recondition it when worn, as compared with 1/32 in. for the conventional cutter. (This may not be true in all cases, because conditions vary too much, but there appears to be a definite over-all reduction in grinding to recondition the high-rake cutter.)

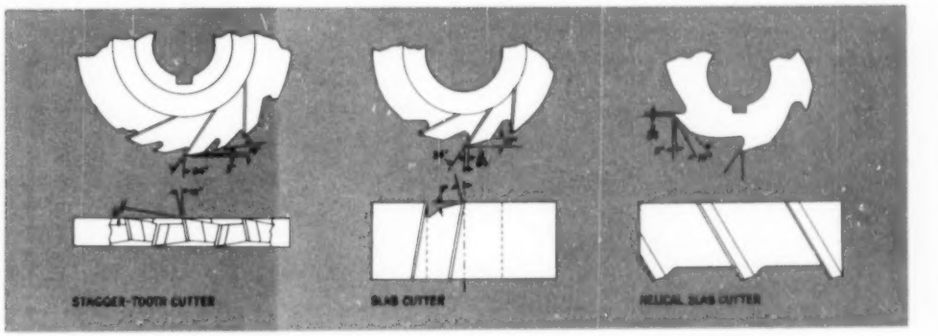
This type of cutter has been installed on all machines arranged for climb-milling, and we find the technique entirely satisfactory. Obviously, there must be no backlash in climb-cutting. Soluble oil is the cutting fluid.



SETUP FOR HIGH-RAKE MILLING of broach teeth in a Sundstrand production miller No. 96-810. Cutting fluid, turned off for this photo, is soluble oil



CONVENTIONAL FORM-MILLING CUTTERS (top) compared with the newer high-rake design (below). All are 4-in. dia with form-ground teeth, the former cutters having radial-neutral rake, the new ones 25° positive rake



THERE IS SOME SHEARING in the action of the high-rake cutter (types shown at left), which means that less force is required to move the cutter through the material. As a consequence, much less heat is generated. Speed of chip removal is increased, which reduces tool crowding and cuts down on friction found in conventional milling. Chips from a conventional cutter compared with those from a high-rake tool indicate that the high-angle tool doesn't burn or compress the chip. The chip is not discolored and appears to be cut off rather than "crushed" off

PS MACHINE TOUGH STAINLESS

ed was 61 rpm (73 fpm),
t ½ in. deep.
he same specification oper-
onditions gave successful
en increased to 8 ipm, speed
d depth of cut to ⅞ in. No
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over 88% more material in
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not heat. In fact, after such
r can be touched with the
he cutter in this particular

application seems to be far beyond available speed of the machine.

SPECIAL ALLOYS

Alloy steels such as GE-B5F4B or chrome-moly A151-4142 were machined successfully at hardness of 35 R. and feeds of 6 ipm at 80 rpm (89 fpm) speed. No tool wear was evident in the test.

FURTHER APPLICATIONS

Use of the design is not limited to cutters; excellent results have been obtained from a modified application on taps. For example, three-fluted taps were ground at 25° rake angle on the cutting edge and used in type 365 sand-cast aluminum. The hook on tap teeth improved action of the tap and made it possible to machine-tap castings of this material. Previously, the job had to be done by hand and even then the job was troublesome. Stainless steel can be tapped readily at higher speeds with longer tool life and less breakage. A possible explanation is that the increased rake angle allows the tool to "shave" the chips out of the threads, giving better chip curling and clearance. Both milling cutters and taps show less tendency to load with chips when high-rake angles are employed.

Research is continuing on application of high rake cutters and taps to a wide range of common hot- and cold-rolled steels. Thus far, desirable feeds and speeds have been attained without any indication of burning of the tool. Even without cutting fluids, cutters did not heat excessively. Investigation is now being undertaken in tapping copper in the hope of eliminating the stringy chips which cause jamming in most threading and tapping operations.

In sharp contrast to the preceding tests, considerable research in the application of high rakes to single-point lathe tools has not proved successful. Apparently, where a single point is required to do all of the work there is not enough tool body to give satisfactory results; tungsten-carbide tools remain the best solution. However, preliminary investigation in the application of high angles to external thread cutters and chasers is encouraging, although chasers of a special design may be required to prevent thread distortion.

BRITISH TEST HIGH RAKES ON PHOSPHOR BRONZE

Several English companies have recently experimented with high-rake milling cutters, following American design, according to *Machinery* of London. One deterrent has been non-availability of millers capable of down-cut milling. Glacier Metal Co, Ltd, in Middlesex, tested a 6 x ½-in., 12-tooth HSS cutter with 35° rake and 10° helix. At 153 rpm (240 sfpm), with 10 ipm feed, mild-steel bars were climb-cut at depths from ⅛ to 1⅛ in. in a single pass. Finish was better on side walls of cuts than with conventional cutters, even for the 1⅛-in. cut, even though the thin webs between cuts (0.03 to 0.04) permitted some vibration. After 33 cu in. of cutting, no wear was apparent on teeth. Chip load was in all cuts above 0.004 in. per tooth — an important factor.

Additional tests involved ¼- and ½-in. cuts on a LB9 phosphor-bronze half bearing at the same feed and speed. Free cutting action was obtained, and the testers believe feed could be increased to raise tooth loading to as much as 0.015 ipt. Power consumption was much reduced, important in cutting a fragile part like a bearing shell. Residual stresses were low because of the shearing action, and surface finish much improved.

As a result of these tests, applications are to be made as quickly as possible, preferably on millers with steplessly variable feeds. — June 26, '53, p 1203.

RESEARCH RESULTS E

Rake angles on the majority of HSS cutters in current use vary from 5 to 15°. Too often, the only justification for such angles is tradition. Could better performance be realized from the same HSS cutter merely by changing the rake angles? Could an increase in production be obtained with, at the same time, better finish and less power consumption? Very little information has been available, until recently, regarding the influence of rake angles on tool life for milling with HSS cutters.

A face-milling and a slab-milling operation were chosen for study, including orthogonal cutting tests with a tool dynamometer. Rake angles from 0 to 50°, at four general speeds, 70, 160, 300, and 500 sfpm, were explored. SAE 1020 hot-rolled stock was cut, with a chemical emulsion-type cutting fluid, mixed 25 to 1.

RESULTS

In face milling, metal removal for 0.020-in. tool wear was best for 30° rake at all speeds above 100 fpm. It is obvious that larger rake angles give improved tool life at high cutting speeds, low cutting life at low speeds (below 100 fpm) because of chipping under action of the builtup edge. Chips are less deformed by cutters with higher rake angle, showing force on the tooth is decreased. Actually, cutter life with the higher rake angles will be as high at 164 fpm as the usual 15° rake at 71 fpm —

HIGH-HELIX CUTTER MILLS TITANIUM

Skiving action in face-milling cuts cleanly at 210 sfpm, four times conventional speeds. Nimonic 80 and Inconel X also cut

By DAVID C KAUFFMAN, Carbide Tool Engineer, DOUGLAS TOOL COMPANY, DETROIT

Tests were recently made on titanium alloys at the University of Michigan by Prof W W Gilbert and the author, and later at our own plant, with a Douglas Hi-Helix cutter designed for contour-milling jet blades and buckets of Nimonic 80, Inconel X, and titanium. Surface speeds ranged from 40 to 375 fpm, feeds from 0.0008 to 0.006 in. per tooth, with a depth of cut of 0.025 in. Grooving and contour-cutting were also done at 0.09 in. depth of cut.

In contrast to normal surface speeds of 40 to 50 sfpm recommended for titanium and refractory metals, satisfactory cutting action resulted at 210 sfpm. Above this speed, action was not good, and at 375 sfpm, chips were burned and deformed excessively. Optimum feed per tooth appeared to be 0.002 in. There was no evidence of chip welding to cutter faces, chips did not burn or pack in flutes, and the work did not heat. The cutter did not chatter or pound, showed no burning or chipping, and gave satisfactory life. Life is extended and cutting action made smoother if climb milling is done; the cutter is designed for climbing. Finishes on workpieces were good and in inverse proportion to chip load per tooth.

These results are ascribed to the fact that up to six teeth are in constant engagement over their full length in the workpiece, as compared to four or six points with a cutter of conventional shape. The blade skives into the material, removing a chip thin at beginning and end and shaved off rather than "chopped" or "bulldozed" off by impact. This also avoids strain or workhardening of the cut surface and improves finish.

S EXPLAIN IMPROVEMENT

Digested from the ASME paper "The Influence of Higher Rake Angles on Performance in Milling," by J H Crawford, research engineer, and M Eugene Merchant, asst director of research, The Cincinnati Milling Machine Company

giving more than double the production rate at the same feed per tooth and tool life. Optimum true rake (max tool life at a given cutting speed) increases with increasing cutting speed.

SLAB MILLING

Similar slab-milling tests with a 5½ x 8 x 1½-in. 30° rake, 45° helix cutter supplied by Union Twist Drill showed similar results, except that tool-life curves show no breaks – because no builtup edge occurs even at low cutting speeds. Actually, a 10° rake at 68 fpm and a 20° rake at 152 fpm each removed 100 cu in. per grind – *an increase of 100% in production rate by doubling the rake.* At 70 fpm, the 30° rake gave best surface finish, the 10° the poorest. At higher speeds, surface finish was good and independent of rake.

Cutting force was found to decrease steadily with increasing rake – because of a large increase in shear angle. Coefficient of friction, however, increases with increasing rake, quite rapidly above 40°, so above that figure forces are independent of rake. This helps explain the optimum rake of 30 to 40° in face milling.

Interface temperature decreases steadily with increasing rake to about 40°, thereafter increasing rapidly.

Superior performance (improved tool life and surface finish) obtained with higher rakes and cutting speeds, within the limitations of these tests, is mainly a result of these basic factors:

1. Higher shear angle and correspondingly shorter path of shear.
2. Lessened cutting forces.
3. Lower chip-tool interface temperature.
4. Greater metal-removing efficiency and a correspondingly lower value for work done in cutting.
5. Less builtup edge, in turn causing less wear from abrasion and chipping.

The fact that at higher cutting speeds a maximum tool life is obtained in face-milling with rake angles of 30 to 40° is a result mainly of these factors:

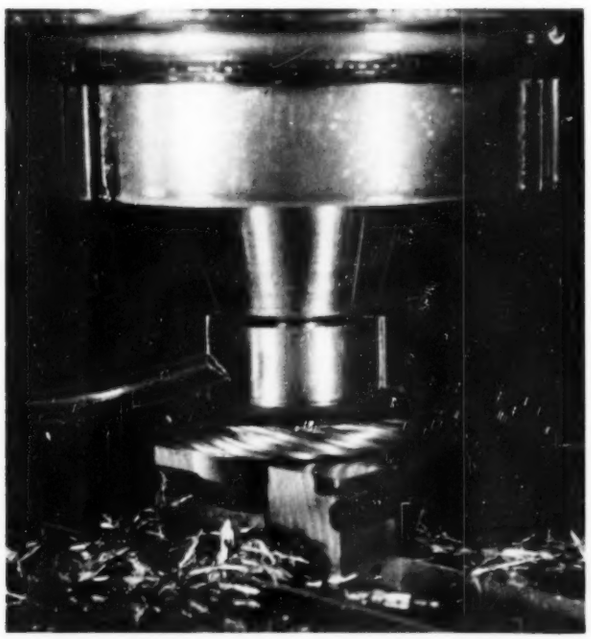
1. With very low rake angles, shear angle is low, tooth forces are high, a builtup edge is present, and tool-ship interface temperatures are high, though falling with increasing rake angle.
2. With very high rake angles, the tooth form is fragile, tooth forces are no longer decreasing appreciably with increasing rake, friction coefficient is high and rising rapidly, and tool-chip interface temperatures are high and rising rapidly with increasing rake angle.

ADVANTAGES

1. A higher cutting speed for the same tool life is possible, or –
2. Longer tool life at the same cutting speed (above a certain minimum value of cutting speed).
3. Better workpiece finish is obtained because of the absence of builtup edge.
4. Less power is required for the same metal-removal rate.
5. Cutting forces are lower, and consequently there is less deflection and greater accuracy.

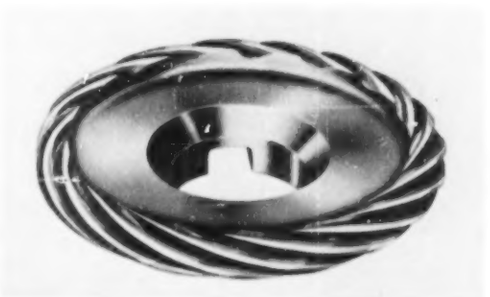
DISADVANTAGES

1. More care is required in handling and storage of the cutters because of their comparatively fragile tooth form.
2. Greater care must be exercised in sharpening high-rake cutters, as there is less metal present in the tooth to dissipate the heat generated in grinding.
3. High-rake cutters do not stand up well under abrasion, so usually cannot be used for roughing or finishing cuts into scale or surfaces with abrasive inclusions. A previously machined or ground surface is best.
4. Cutting fluid used must be generous to aid in heat dissipation.
5. While higher rake gives improved performance when milling SAE 1020 steel and even, as reported by others, when milling unhardened high-speed steel, it is understood that with some few types of steel improved performance is not obtained in practice. Further research is needed to clarify this point.



TITANIUM 150-A was milled with the cutter held in an adapter in a vertical miller. Heavy soluble oil was the coolant; synthetic cutting fluids might have improved performance

CHIPS FORMED AT LOW SPEEDS were tight, needle-like curls like those at left; at high speeds, they became fluffy shavings as at right



CUTTER is a recently developed type, 2⅛ in. in dia, with 20 teeth, 72° spiral helix, 0° radial rake, HSS, with a ½-in.-dia hole. High helix apparently enables the cutter to clear itself of chips even though flutes are very small. It can be carbide

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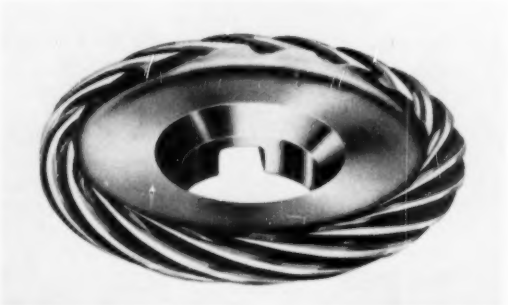

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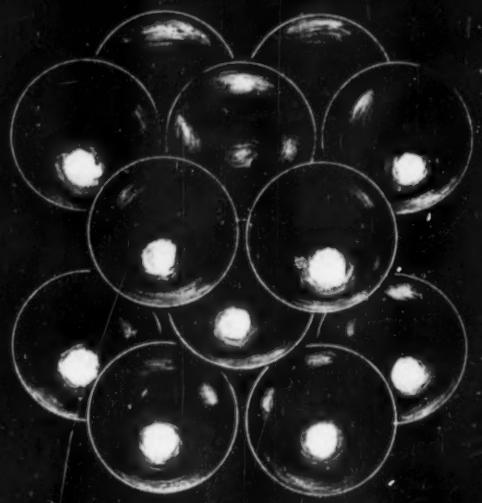
how crystal structure affects metal forming...



By SAMUEL STORCHHEIM, Senior Metallurgical Engineer
SYLVANIA ELECTRIC PRODUCTS INC, BAYSIDE, N Y

"CRYSTAL STRUCTURE!" we hear our readers saying, "How highbrow can *American Machinist* get? With all of my production problems, what do I care about crystals! That is a subject for my metallurgist."

We, too, are concerned with your production problems. That is precisely why Mr Storchheim was asked to prepare this report for you. The crystal arrangement within a metal has always been a major factor in all of the properties of that metal, and in its workability, but the subject was largely confined to the laboratory.

Recently there have been rumors. Several large companies are tying crystallography directly into the production line as a control measure. Before forming, every sheet of stock will be examined for structure and variations in heat-treatment or working will be made for each sheet. Another manufacturer has developed a device for measuring hardness based on the variations in electrical conductivity caused by crystal structure. Machinability is largely determined by the crystalline pattern of the material. A constant supply of material having consistent structure, without deviation, means fewer production interruptions and reduced tool damage. You will hear much more of this subject in the years ahead.

True, the metallurgist will always be concerned with the details of organization and application. This report will help you to orient his science with your experience as it takes crystals out of the laboratory and into the shop. *The Editors.*

American Machinist SPECIAL REPORT NO. 345 TO THE METALWORKING INDUSTRIES

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what is metal?

Continuous study of the various materials which constitute the earth shows it to be composed of, at present count, 98 elements. (Some of these elements have only recently been "made" by man during atomic-energy experiments.) It is known that these substances cannot be further broken down without losing their basic identities. In addition, these 98 elements are segregated into three groups having similar characteristics: metals, metalloids, and non-metals.

Metals are characterized by having, among other things, four attributes:

1. Ability to undergo considerable deformation without breaking.
2. Ability to conduct heat and electricity readily.
3. Ability to exhibit a high luster.
4. In addition to the above, they have a characteristic ringing sound when struck.

Elements which show little or no plasticity (ability to be deformed) but do exhibit some conductivity are shown as metalloids. Into this group fit carbon, boron, and silicon. Metals do not ordinarily combine with each other to form chemical compounds with metals or with other metalloids.

Non-metals comprise the group of elements which show neither plasticity nor conductivity. This category includes sulfur, chlorine, and oxygen.

For all elements, the smallest basically recognizable form is the atom. These atoms, in turn, have geometric relationships to each other. More succinctly, the atoms are bound together in various ways, just as a wall of bricks might be held together. Similarly, a brick wall can be constructed with the individual bricks in many different arrangements; some stronger, some weaker. In the same way, the atoms of different elements, or atoms of the same element under different conditions, organize themselves into a variety of patterns. However, the pattern is always the same for the same element under the same set of given conditions.

By the use of X-ray diffraction, the exact pattern of each atomic arrangement has been learned. Diffraction is, simply, the scattering of a beam of X-rays by the atoms of a given element as the beam passes through a sample. The diffraction pattern is either recorded photographically or with an electronic scanning device.

With these arrangements known, particularly for metals—which constitute approximately two-thirds of the 98 elements—a better understanding of the properties of materials is available. This is especially true for understanding how metals deform during rolling, forging, wire-drawing, and similar operations that depend upon plasticity. It also explains why some metals do not deform as readily as others. The geometric relationship of the atoms within a "crystal" of element is known as its "crystallography."

metal crystallography

In metals, the arrangement of atoms has a very high degree of symmetry. If the reader could be dropped inside of a cluster of metallic atoms, he would see from where he stood that the atoms were uniformly disposed around him in a pattern that was exactly repeated in all directions and as far as the metal extended.

Better to understand crystallography and symmetry, a system of straight lines extending in three dimensions has been established. It is called a *space* lattice. Imagine, again, a group of building blocks or bricks placed together to form a wall. In their "wall," the atoms are distributed in a definite pattern that is repeated at regular intervals. A single, complete, unit of this pattern, as shown by the heavily outlined block of the space lattice (Fig. 1) is called a *unit cell* and is measured in terms of the three edge-lengths labeled "a," "b," and "c." The three edge-lengths of a unit cell also are the three crystal axes of the unit cell. For metals, the grouping of the atoms within each block or unit cell is identical.

Miller Indices were devised to provide a system of identification for the faces of the unit cells and for any lines or planes (lines in two dimensions) cutting through a unit cell. These indices are based upon:

1. The axes of the unit cell being cut, or intersected, by the plane of interest (Fig. 2).
2. The fraction of the axis from the point "o," origin, determined by a definite value. For example, if the plane halves the "a" length on the X-axis, the fraction or intercept is ½. If the cut is 2/3 along the "b" length on the Y-axis the intercept is 2/3 and when the full length of "c" is intercepted along the Z-axis the numeral is 1. This procedure is followed for all three axes. Hence, "a" could be ½; "b," 2/3; and "c," 1.
3. After determining the three fractions, they are inverted and reduced, by the least common denominator, to the smallest whole numbers having the same relationships as did the original fractions. Thus ½, 2/3, 1 would be inverted to 2/1, 3/2, 1; then converted by the lcd 2 to the integers 4, 3, 2.
4. When these three numbers are enclosed in parenthesis (432), they are the Miller Indices of the plane and locate its position in space.

NEGATIVE INDICES

A plane can have negative indices if it falls on a minus axis (Fig. 3). The plane shown cuts the X, Y, and Z axes at ½, −½, and ½, respectively. Inverting the fractions gives this plane the Miller Indices (2 $\bar{2}$ 2), the negative index denoted by a minus sign over the integer. Actually, a unit cell can be placed in eight different quadrants—one directly behind each of the cells shown in Fig. 2 and Fig. 3 plus four others beneath these four. Hence, it is possible to have a plane cutting the unit cell in the same manner in each quadrant, which results in eight planes all having the same numbers but each plane having a different combination of signs. The eight planes using the indices (2 2 2) then would be:

(2 2 2), (2 $\bar{2}$ 2), (2 2 $\bar{2}$), ($\bar{2}$ 2 2), ($\bar{2}$ $\bar{2}$ 2), ($\bar{2}$ 2 $\bar{2}$), (2 $\bar{2}$ $\bar{2}$), ($\bar{2}$ $\bar{2}$ $\bar{2}$)

To be accurate, there are not eight planes represented above, but four, as each plane noted has one parallel to it, (2 2 2) is parallel to ($\bar{2}$ $\bar{2}$ $\bar{2}$). Parentheses around Miller Indices indicate a single plane or a set of parallel planes. Braces, curly brackets, represent planes that are equivalent, for example:

$\{200\} = (200) + (020) + (002) + (\bar{2}00) + (0\bar{2}0) + (00\bar{2})$

Zero values occur when a plane does not intersect an axis but runs parallel to it (Fig. 4). Then the intercept is infinity, ∞. As the reciprocal of infinity is zero, the "o" index is derived.

Miller Indices for some of the more important planes in metals are shown (Fig. 5). The $\{100\}$ are termed the cube planes of the unit cell. There are six of these indices representing the six sides

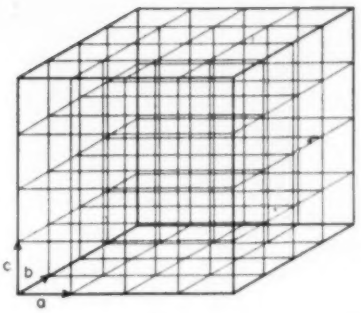


FIG. 1—LATTICE IN THREE DIMENSIONS constructed as if building blocks were stacked side by side. The three edge-lengths of a unit cell are identified as "a", "b", and "c", as shown by the heavy lines in the lower left corner

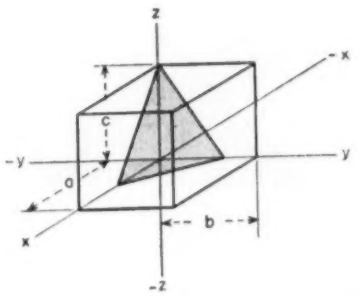


FIG. 2—UNIT CELL is intersected by the shaded plane (432) at points ½ of the distance "a", 2/3 of the distance "b", and the full distance "c", on their axes X, Y, and Z, respectively

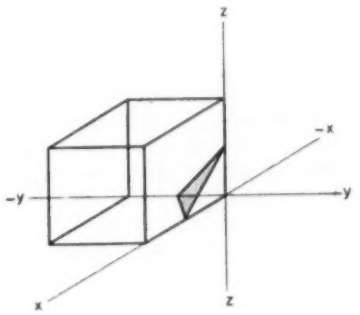


FIG. 3—PLANE (222) indicates a unit cell partially located on a negative, −Y, axis

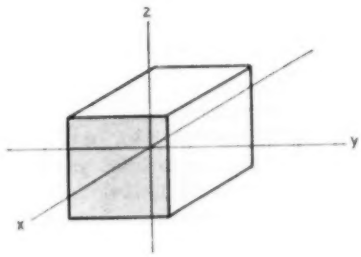


FIG. 4—SHADED PLANE IS (100). It never intersects the Y or Z axes but only the X axis at 1

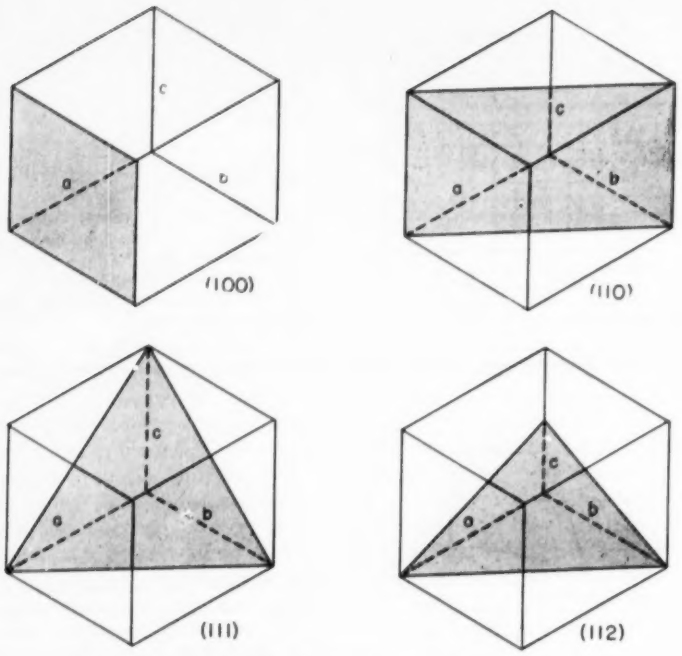


FIG. 5—MOST IMPORTANT PLANES in metal crystallography are shown by shading—(100), (110), (111), and (112)

of a cube but, because three sets are parallel to each other, actually there are only three cube planes. The $\{110\}$ are called dodecohedral planes of a unit cell. Six of these planes are different; are not parallel. The $\{111\}$ are designated as octahedral planes. Four octahedral planes have different indices and are not parallel to each other.

Each plane in a unit cell has direction. The indices of direction are obtained in a different manner from the Miller Indices for location of the plane. To get the direction of the plane, the actual numbers are counted off on each axis and a line is drawn to the terminal point from the starting point. For example, if the direction were [235], direction being denoted by square brackets, a mark is made at a distance of two units along the X-axis. From this point, the next move is three units along the Y-axis and then another five units parallel to the Z-axis. This final point is connected to the original starting point with a straight line. This line represents the direction [235]. In *cubic* systems, the direction is perpendicular to the plane and has the same indices as the Miller Indices of the plane to which it is perpendicular.

For example, [111] is perpendicular to (111). Whereas equivalent positions are denoted by braces $\{\ \}$, equivalent directions are shown by carets $<111>$.

While the foregoing means little to the man concerned with drawing a sheet of magnesium, it is important to realize the extreme detail with which the structure of that sheet can be defined. Thus its reaction to working stresses can be forecast.

SPACE LATTICES AND CRYSTAL SYSTEMS

Only 14 space lattices are possible and these 14 lattices fall into seven crystal systems. Each of the seven crystal systems has a specific, basic, geometric characteristic regarding the lengths of its axes and the angles between these axes:

1. *Cubic*—Three axes equal and perpendicular to each other.
2. *Tetragonal*—two equal axes perpendicular to each other and a third axis not equal in length to the other two.
3. *Hexagonal*—three equal axes inclined to each other at an angle of 120°, having a fourth unequal axis perpendicular to all three equal axes.
4. *Rhombohedral*—three equal axes inclined to each other but not at 90°; not perpendicular.
5. *Orthorhombic*—three axes at 90° to each other but having unequal lengths.
6. *Monoclinic*—three unequal axes, two of which are at 90° (perpendicular) to each other.

Metals comprise about two-thirds of the earth's elements. Interestingly, the great majority of these metals fall into two crystal groups and only three of the 14 space lattice groups: face-centered-cubic (fcc), body-centered-cubic (bcc), and hexagonal-close-packed (hcp). As these groups are predominant, it is important to discuss them in detail. The first two, body-centered-cubic and face-centered-cubic are the principal crystal forms of iron. This condition accounts for the fact that iron is more readily forged within a specific temperature range than at any other temperature. See "How to Understand Plain Carbon Steel" (*AM*—Mar 30 '53, p111).

Body-entered-cubic cells have one atom at each corner of the cube and one atom in the center. Study of a single cell in the lattice shows that each corner atom is shared by seven other adjacent

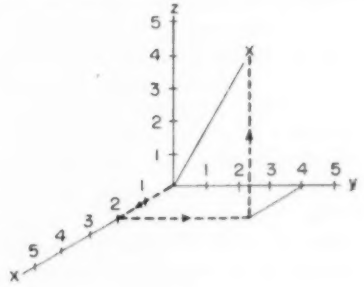


FIG. 6—DIRECTION OF A PLANE is found by moving a point parallel to each of three axes, tracing one axis at a time and continuing from the stopping point on one axis to the next one. Direction is line connecting final stopping point with origin

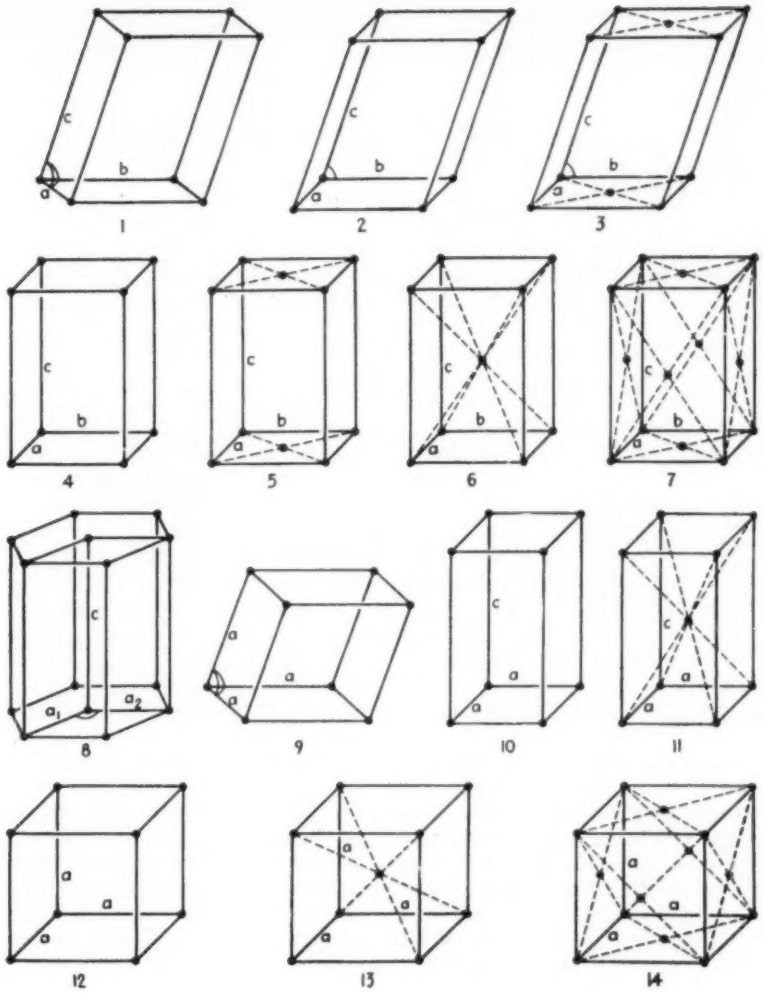


FIG. 7—14 SPACE LATTICES illustrated by a unit cell of each: (1) triclinic, simple; (2) monoclinic, simple; (3) monoclinic, base centered; (4) orthorhombic, simple; (5) orthorhombic, base centered; (6) orthorhombic, body centered; (7) orthorhombic, face centered; (8) hexagonal; (9) rhombohedral; (10) tetragonal, simple; (11) tetragonal, body centered; (12) cubic, simple; (13) cubic body centered; (14) cubic face centered

cubes (Fig. 9). Thus, only ⅛ of an atom per cube corner belongs to each unit cell. As there are eight corners on a cube, a total of one atom per unit cell is contributed by each cube in the lattice. The atom at the cell center is completely contained within the individual cell, hence is not shared with any other cells and thus contributes another full atom to the bcc cell. In total, each bcc cell has the substance of two atoms.

As can be seen (Fig. 8), the atoms are not all in contact with each other; there are empty spaces between them. All of the corner atoms touch the center atom but do not touch each other. Suppose we arbitrarily pushed playing cards into an enlarged bcc cell so that they touched as many atoms as possible. We intersect the cell with planes. Observe that the cards whose Miller Indices were $\{110\}$ touched the maximum number of atoms. Thus, the $\{110\}$ in the bcc cell are referred to as the planes of greatest atomic packing. This fact is important; will be discuseed further in the section on plastic deformation.

Face-centered-cubic-cell atoms are located at the cube corners, but there is no atom in the center of the unit cell. Instead, individual atoms are located at the center of each cube face. This time the eight corner atoms are shared as in the bcc cell and the six face atoms are shared with the faces adjacent to them, hence the corners contribute one atom per cell and the faces contribute three atoms, for a total of four atoms per elemental fcc cell.

The close packed family of planes in the fcc cell is $\{111\}$. Comparing the fcc and the bcc shows the packing of atoms to be greater

table 1—CRYSTAL SYSTEMS AND MATERIALS

System	Examples
Cubic	iron, copper, nickel, silver, gold, tungsten, common table salt
Tetragonal	white tin, white martensite, and titanium dioxide
Hexagonal	titanium, zirconium, zinc, cadmium
Rhombohedral	arsenic, bismuth, antimony
Orthorhombic	gallium, cementite (Fe_3C), and alpha-sulfur
Monoclinic	polonium, beta-sulfur, gypsum ($CaSO_4 \cdot 2H_2O$)
Triclinic	potassium dichromate ($K_2Cr_2O_7$)

FIG. 8—ONE UNIT CELL of the bcc structure shown by points at the left and as hard spheres at the right. Center atom touches each corner atom but these do not touch each other. Thus, each cell provides two atoms to the mass. *Crystal* usually suggests a solid with flat, external faces at definite angles to each other. As used scientifically, the word means a regular internal arrangement of atoms, repetitive in three chosen directions. It is only in special circumstances that this condition is accompanied by external crystal faces

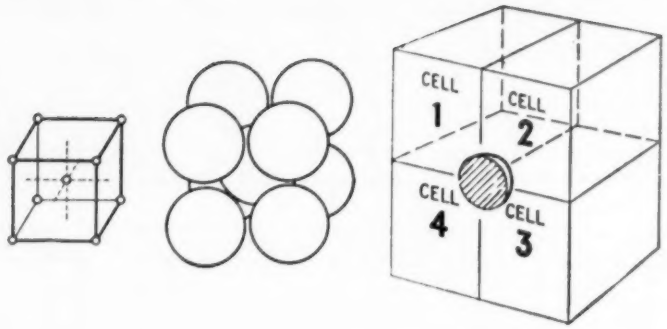
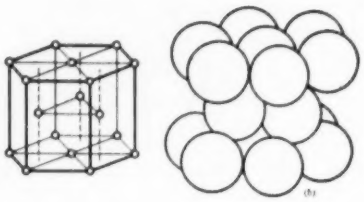


FIG. 10 HEXAGONAL CLOSE-PACKED (hcp) unit cell shows location of atoms by points at the left and as hard spheres at the right. All atoms on base planes are in contact with each other and atoms on the intermediate plane "nest" in three of the six niches so formed



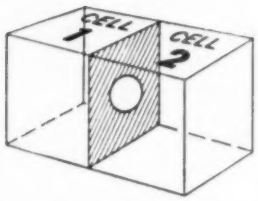


FIG. 9—TWO FACE-CENTERED-CUBIC cells share each face atom

for the fcc unit cell than for the bcc cell. This means there are fewer empty spaces in the fcc cell than in the bcc cell.

Hexagonal - close - packed - cell contains three "layers" of atoms; seven atoms in the top and bottom layers, all touching each other, plus three atoms touching each other and nestling between the top and bottom layers. These three atoms fit into the niches formed by the contacting layers of seven atoms. This nestling, perhaps, can be more readily visualized if one arranges marbles or tennis balls into this configuration. Note that the layers of seven atoms are in the form of a hexagon, hence the name "hexagonal" unit cell. The basal plane, (001), is the closest packed in this particular unit cell.

If this unit cell is broken up into three individual parts (Fig. 11), it is seen that each part is similar to the bcc unit cell; therefore contributes two atoms to the top unit cell. Thus a total of six atoms are contained in an hcp cell because the three parts each contribute two atoms. Note in Fig. 11, cell 1, that the lengths of the cell are noted as: "a" for the base and "c" for the height. These identifications of parameter lengths are necessary to describe the size of the hcp cell. Only "a" is required for bcc and fcc cells, as only this one dimension is required to draw them.

Of the three cells discussed, the greatest degree of close packing is in the fcc cell. The next in degree of close packing is the hcp cell, while the least closely packed of the three is the bcc cell.

table II—MOST COMMON LATTICES FOR METAL CRYSTALS

Body-centered cubic	Face-centered cubic	Close-packed hexagonal
iron	copper	cobalt
chromium	silver	magnesium
tungsten	gold	zinc
molybdenum	aluminum	cadmium
tantalum	nickel	zirconium
vanadium	lead	titanium
potassium	platinum	beryllium
sodium	palladium	
lithium	thorium	

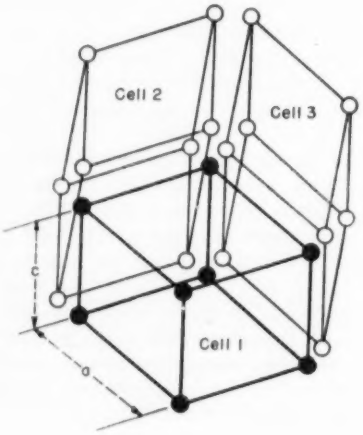


FIG. 11—HEXAGONAL CLOSE-PACKED unit cell divided into three unit cells, 1, 2, and 3, to show that two atoms exist in each partition for a total of six atoms in the complete hcp cell

plastic deformation

Metals can be deformed, can have their shape changed, either hot or at room temperature, by methods such as: forging, swaging, rolling, wire drawing, deep drawing, stamping, and spinning. This deformation of metals occurs by a process known as "slip." Simply stated, "slip" can be understood by observing a neatly stacked deck of cards. Disturb the deck, and the cards slide over each other. This sliding of the cards is similar to the sliding or "slipping" of layers of atoms past one another.

Slip in metals occurs along definite crystallographic planes. That is, certain layers of atoms in the metal crystal (individual grains in the metals) tend, upon being pushed by the deformation pressure, to slide or glide past other layers of atoms. Usually, the layers of atoms that slide or slip are the close packed layers of the various unit cells. Thus, for the fcc unit cell the $\{111\}$ slip, for the bcc the $\{110\}$ slip, and for the hcp, the $\{001\}$ slip.

DIRECTION OF SLIP

Not only do these closest packed planes slip but they tend to slip in specific directions and always in the direction of the closest packed atoms. The $\{111\}$ of the fcc unit cell slips in the $<110>$, the $\{110\}$ of the bcc unit cell slips in the $<111>$, and the $\{001\}$ of the hcp unit cell in the $<210>$. A plane of atoms and the direction of its slip are known as a slip system. Figs. 12 and 13 show schematically how slip occurs in a metal. For the fcc unit cell there are four (111) planes and three [110] directions. Therefore, four times three shows there are 12 possible slip system combinations for slip to occur in this unit cell. The bcc unit cell has four [111] directions around each of which are arranged six slip planes. Thus, 24 slip systems exist for this unit cell. The hcp unit cell has one (001) plane (the basal plane) for slipping and three [210] directions or a total of three slip systems. Because the hcp unit cell has so few slip systems compared with the fcc and bcc cells, it does not deform as readily as they do. This fact is of practical importance because slip systems operate in such a manner that when one slip system no longer is operative (a specific plane of atoms in one direction can no longer slip or glide), then another slip system starts to work. (Magnesium must be formed on heated dies.) Thus, the more slip systems available, the greater the opportunity for slipping to occur before all of the slip systems become inoperative and, on further deformation, the metal ruptures.

Experiments with single grains of metals (single crystals) have shown a simple relationship between slip and applied stress (deforming pressure). If the angle of the slip plane and the angle of the slip direction are taken into account, then a metal will slip at a constant stress. Conversely, individual specimens of single grains of metal having their slip planes and their directions of slip at different angles will all slip at different stresses. However, if the angles of the slip planes and directions for each specimen are properly related to the stress needed to cause slip in each crystal, that is, if the stress is resolved on the slip plain and in the slip direction, then all values calculated are equal. This constant stress value is called the "critical shearing stress," and is generally measured in kilograms per square millimeter, kg/mm^2. (One kg/mm^2 is approximately equal to 1400 psi.) Fig. 14 shows how two crystals can have their slip planes and directions at different angles from each other.

Critical shear stress is affected by a number of factors. If the metal contains impurities, dissolved in it like sugar in tea, the foreign atoms do not fit into the lattice perfectly, hence they dis-

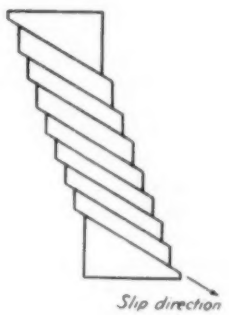


FIG. 12—DEFORMATION of a crystal as a result of "slip" can be compared to a stack of checkers pushed out of alignment but not toppling over

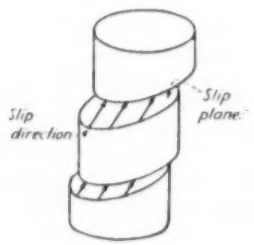


FIG. 13—HOW A METAL SLIPS. Slip planes are located at the point of cleavage. Arrows show direction of slip (direction the sections take in sliding past one another)

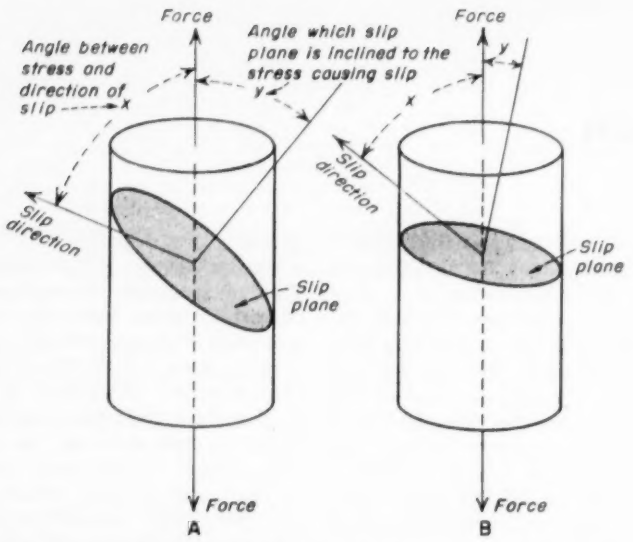


FIG. 14—TWO SINGLE CRYSTALS, A & B, having slip planes and directions at different angles. By relating, for each crystal, the angles x and y plus the force required to cause slip, a constant value of force necessary for slip to occur is found. This value is called the *critical shear stress*

tort the unit cells. This distortion reduces the ability of the slip planes to glide readily; thus raises the critical shear stress. If the impurities are only mechanically mixed in the metal, like salt and pepper, little effect is found on the critical shear stress (Fig. 15). If the metal is in a hardened condition caused by previous deformation at room temperature, the shear stress for continued flow is raised (Fig. 16). This is the phenomenon of work hardening. This stress is also raised if the force causing slip is applied more rapidly (Fig. 17). The critical shear stress is lowered if the temperaature of the metal is raised and the tests are then carried out. (Fig. 18).

Metals which do not crystallize in the bcc, fcc, or hcp arrangement do not have the necessary slip systems, the close-packed planes and directions, required for slip or deformation. They are, therefore, not as readily deformed; can behave in a brittle manner. Hence, these metals are not used as extensively as the more plastic metals. It is known that a number of elements do change their crystallographic structure when at higher temperatures. An example would be the changes which occur when iron is heated. It is bcc from room temperature to 1670 F, then it changes to fcc. Heating past 2550 F causes the fcc structure to change back to bcc.

PRACTICAL APPLICATION

The crystallography of metals has a pronounced effect in actual practice. One common example is that of deformation itself. A metal deforms by means of the slip systems. If one system is operating the metal starts to get harder as deformation (slipping) continues; it "work hardens." Eventually the slip system cannot operate because of mechanical interference. When this happens another slip system starts to operate and the process continues until no other slip systems are available. If deformation is continued, the metal breaks. It is common to heat the metal so that the condition of "blocked" gliding is eliminated; the metal is annealed.

Annealing is done during the processing of wire. The wire is drawn, for stainless steel, to a 75% reduction of area. It is then annealed at about 2000 F and drawn another 75%. This is repeated until the desired diameter is reached. If the wire is drawn to 75% reduction of area and not annealed but immediately restrung through more dies, the wire will break during the subsequent draw.

Drawing or rolling metal causes the slip planes to glide into set alignments, called preferred orientation, which causes the metal to have different properties when measured in different directions. Thus, the strength of the metal for a longitudinal section is greater than that for a section at right angles to it, a transverse section. (Fig. 19 shows a picture of a rolled piece of metal, the longitudinal and transverse sections indicated.) This condition becomes more and more pronounced as the percentage of reduction of area is increased. In this arrangement, the unit cells of copper line up after the metal has been rolled. Not only is strength affected by preferred orientation but by all other properties of a metal, such as mechanical, electrical, and chemical. Thus, conductivity can provide a measure of hardness.

Hot-worked and cold-worked steel are a result of this structure. Work-hardening increases with rate of deformation; softening increases with temperature. Hence, there is a critical temperature for deformation of any metal at which work-hardening is just balanced by softening. Above this temperature, metals are hot-worked; metals deformed below it are cold-worked.

Another example is that troublesome condition where drawn cups will not be uniform at the top edge but will have "ears," or high sections of reduced wall thickness. Ears are caused by a non-uniform flow of the metal in

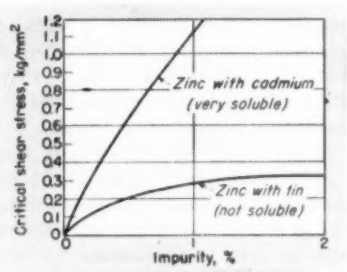


FIG. 15—CRITICAL SHEAR STRESS for zinc as a function of percent impurity. Top curve shows effect of soluble impurity, cadmium, is greater than for insoluble impurity, tin (bottom curve)

various directions because the crystals comprising it are aligned, oriented, in preferred directions.

Magnetic properties are highly influenced by preferred orientation. Silicon steel (3.5% Silicon, balance iron) used in transformers, has exaggerated one-directional magnetic properties. Almost 95% of the crystals, grains, are oriented in the rolling direction. A 60% reduction in the size and weight of a transformer is one result of the superior magnetic properties developed in this way.

Metals of non-cubic unit cells when oriented can show undesirable growth in certain directions during thermal cycling; that is, there is a net flow in a given direction when the metal is heated and cooled. If the grains were completely random in orientation, this undesirable permanent distortion, net flow in a given direction, could be eliminated.

Likewise the diffusion of metals, the migration of atoms, has been found dependent on structure. Cubic unit cells allow diffusion to occur uniformly in the x, y, and z directions. However, the non-cubic unit cells cause diffusion to be more rapid in certain directions than in others.

Production studies of crystal structure are made on an X-ray goniometer, simply an electronic device for measuring the angle at which the X-rays leave the crystal.

USES

Crystallography is used in an ever-increasing number of ways, as it is realized how closely product characteristics are related to ultimate structures. Here are a few metalworking applications:

Alloys—To determine structure, stability range, and the phases, including effects of heat-treatment.

Steel sheet—To aid in the selection of stock having suitable forming characteristics.

Plating—To study the character of plated finishes as a key to their protective powers.

Powder metals—To study the completed products as well as to control character of the powder mix.

Castings—To study the causes, changes, and final effects of age-hardening.

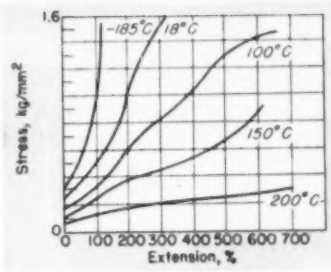


FIG. 16—EFFECT OF DRAW on stress created in zinc at various temperatures. Stress increases as extension increases. Stress is reduced when temperature is raised

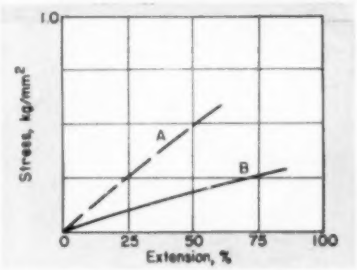


FIG. 17—EFFECT OF FASTER RATE of draw on shear stress for magnesium. "A" represents a pulling rate 10 times *faster* than "B". "A" is higher than "B". Faster rate caused increased stress values for a particular value of extension

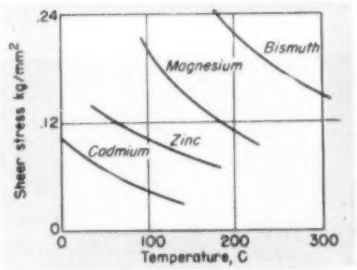


FIG. 18—CRITICAL SHEAR STRESS decreases with increasing temperature

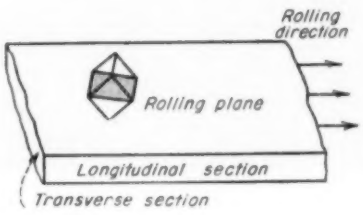


FIG. 19—ROLLED SECTION OF COPPER showing the unit cell with its body diagonal plane parallel to the rolled surface

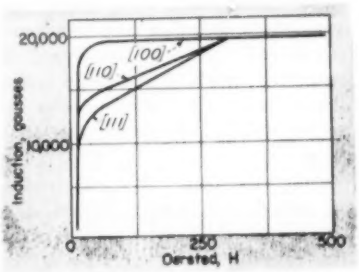
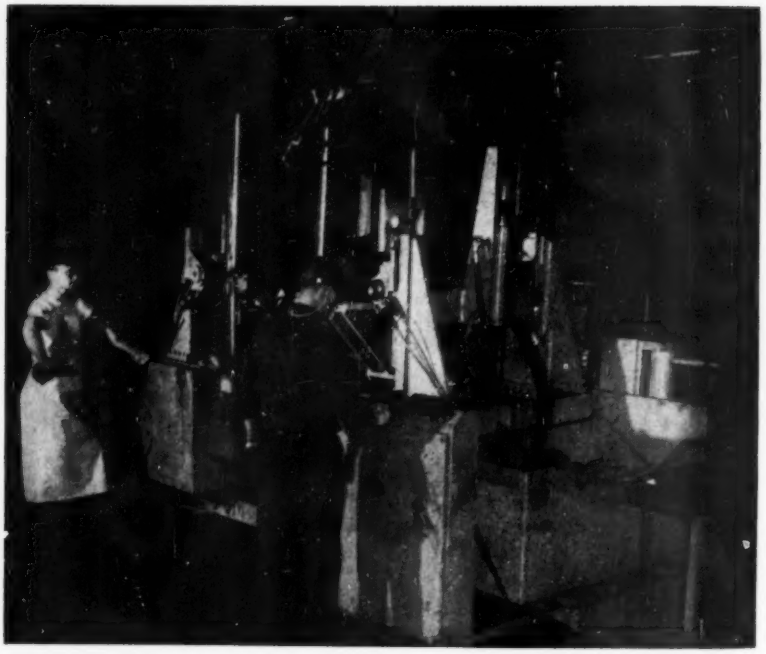


FIG. 20—INDUCTION VS OERSTED shows that the maximum number of Gauss' are achieved most quickly if the bcc unit cells of silicon steel are aligned in the [100] direction

Combination bender and welder makes freezer cabinets

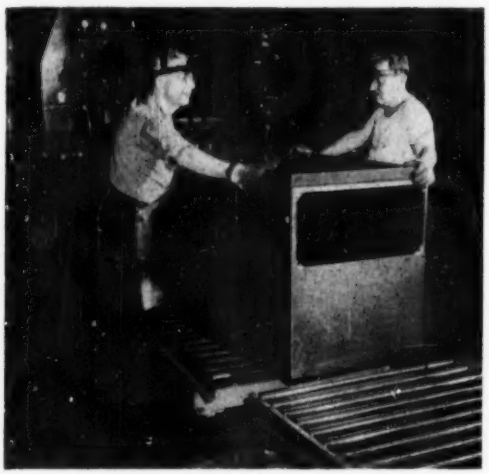
Steel strip, 3x16 ft, is folded up and spotwelded at 16 points in quadruplex tangent bender-welder. Length can be adjusted 16 inches



TANGENT BENDER with auxiliary wings starting to move down to fold rear corners of box. Electrode head will then move down to make 16 spot welds on lapped rear seam

In designing its new food freezer, Frigidaire took into account the possibility of combining bending and welding into a single machine to eliminate the multiple operations involved in assembling the standard five-piece weldment.

The new cabinet shell is made from a 3-ft steel strip, 16 ft long, which is notched and pierced in a press brake, then run through a multiple-spindle cold roll-forming machine to form the top and bottom flanges. Certain holes are pierced in the top flange, hinge and latch reinforcements are welded to the sheet, and it passes to a special Struthers-Wells, quadruplex, tangent bending machine which forms the four corners and spotwelds the lap seam.



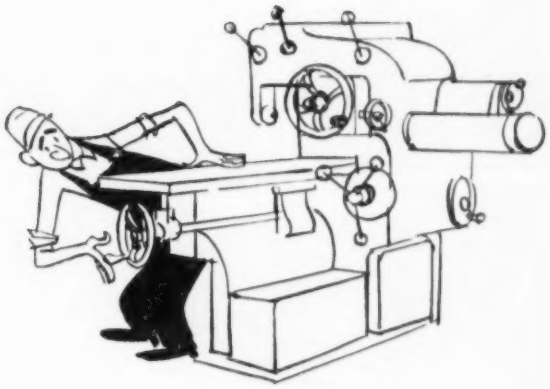
FOLDED AND WELDED frezer shell with floor rail in place is handled on caster-mounted conveyor section for transfer to automatic welder which spotwelds the floor rail

The machine has a horn-type die with four expanding blocks which can be collapsed to permit removal of the work after welding. Work is placed in the machine with the front of the finished shell facing down, and the operator closes a switch to start the automatic cycle. Two main wings move simultaneously into a vertical position through a rack and pinion mechanism to form the two front corners around the horn. The auxiliary wings then alternately fold the rear corners, each wing being actuated by a cylinder and lever arrangement. As the last bend is completed, the welding head automatically lowers 16 electrodes on the lap seam and makes the spot welds.

After welding, the electrodes are raised, the wings unfold, the horn die is retracted, and the horn lifts, leaving the shell resting on wooden supports which facilitate its removal from the machine. The machine is designed so it is adjustable for shells of different capacities. Both the wings and the horn can be adjusted to permit a variation of 16 in. in cabinet length, but the width remains the same for all models.

The floor rail is welded on in a later spotwelding operation, to which the box moves on roller conveyor.

ROUND TABLE



Backward Foreman

"Say, Ed, what do you think of a foreman who can't run all the machines in his department?"

"Why, I dunno, Al. Can't say as I ever heard of such a case. You know any?"

"Sure do. The new foreman in Experimental Machining is Gibson, and he hardly knows a miller from a lathe. How's that for lousy management?"

"Oh, yeah, Al, I remember Gibson, now. But I didn't know he didn't have any shop experience."

"Well, he does have *some* experience, but it's mostly bench work and sheet metal. How do they figure he's going to be able to handle that department full of high-class equipment if he can't run the machines and instruct his men?"

"Maybe the boss figures Gibson has brains enough to pick that stuff up in a hurry. Last time I talked to Harrison, he said Gibson was the best man of foreman caliber they had for the job. Evidently he thinks Gibson can handle the work without trouble."

"How can he, Ed? If one of the men comes up with a problem, how can Gibson tell him how to solve it if he doesn't have first-hand knowledge?"

"Tell you what, Al. There's some cases where common sense and the right kind of mind are more important than immediate experience. That experiental work takes that kind of a mind, and Gibson evidently has it. I suspect Harrison would rather take a chance on Gibson getting embarrassed in front of his men than on wrecking a rush special order or a new set of models."

"Well, Ed, you know that Experimental section doesn't always do that kind of work. There isn't enough of it. How about when they're doing jig and fixture work? What good is Gibson going to be then?"

"Maybe a lot more than the old foreman—Hawkins. He used to get pretty fuddled up when anything out of the ordinary came through. I remember Harrison cussing him out more than once."

"What they need there is simply a good foreman—one who knows the machines and the men, and has some sense, too, Ed."

"I disagree, Al. Sometimes you need a man out of the ordinary for unusual work, and I think Gibson is it."

***CAN ANY FOREMAN** maintain discipline and respect if he can't handle all the machines in his department? Can this ability be foregone if the foreman is hot on ingenuity and drive? Where do you draw the line between ordinary foremen and special leaders? Your opinions on this subject may interest others. Discussions on earlier topics appear on later pages in this issue.*

Practical Ideas

NEW METHOD

Flexible Pipe Replaces Chute, Protects Highly-Polished Surfaces

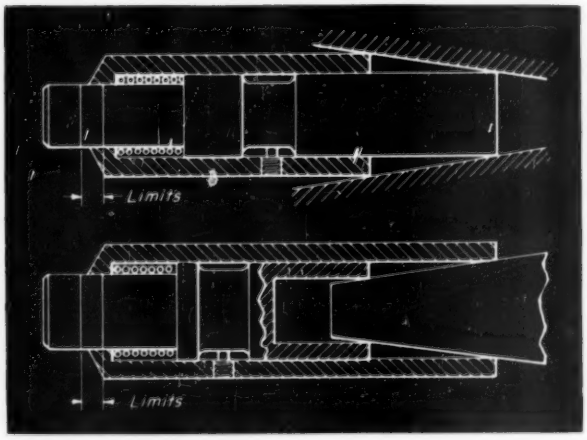
One of the most important components of the taper roller bearings manufactured by The Timken Roller Bearing Company is the roller. Even microscopic flaws are guarded against so that the ultimate product is highly finished and accurate. After finish grinding these rollers, they were dropped down a chute into a receiving tray. Although the drop was only a few inches, the impact of one roller hitting another sometimes would cause tiny nicks on the roller surface, nicks barely visible to the naked eye.

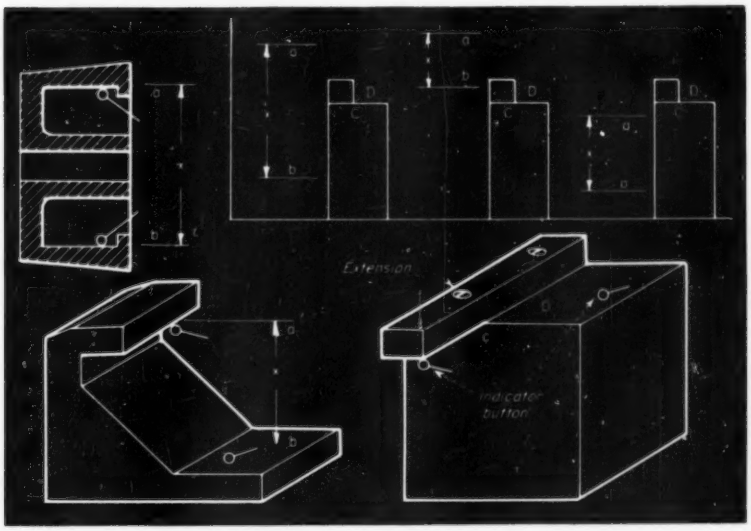
The spring pipe shown replaced the perforated steel chute. This spring pipe, one end encased in leather to avoid nicking the rollers, is rotated in a small circle and at slow speed around the bottom of the receiving tray by a simple gear mechanism. Thus, the roller is literally laid in the bottom of the tray. Nicks have been eliminated and scrap is substantially reduced. *Harry Welsbacher, Canton, Ohio*

OLD METHOD

Internal, External Tapers Checked with Shop Gages

Two easily made gages can readily simplify production checking of internal and external tapers. Each gage consists of two cylindrical members, one a slip-fit into the other. Allowable limits of variation are scribed on the internal member of each gage and this member is held against a setscrew by a spring. In use, the gage is pressed against the taper and the flanged outer end of the external cylinder appears inside of the scribed lines when the part is within limits. The gage can be used with a dial indicator. *Haim Murro, Bayonne, NJ*





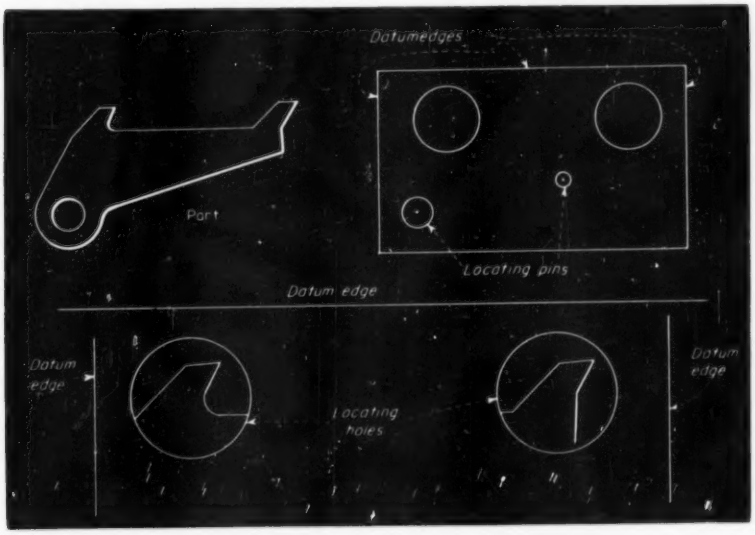
Indirect Gaging Simplified With Quickly-Made Block

An effective method of measuring the relation of machined surfaces to one another when interference prevents direct gaging is shown in these two examples. The method is equally suitable for oval or irregular surfaces such as dies, punches, cam surfaces, and internal or external profile work measurement.

The sample parts show two typical conditions. To measure them a gage-block is prepared with an extension. The height of this block is not important as long as the gage surfaces "C" and "D" are square to the base. Dimension "x" is found by determining the difference between "a" on the part and "C" on the gage and the difference between "b" on the part and "D" on the gage. Then these differences are added or subtracted, depending upon the relative heights of the gage and the part being measured. Three possible conditions are:

1. $x = (a\text{-}C) + (D\text{-}b)$
2. $x = (a\text{-}C) - (b\text{-}D)$
3. $x = (D\text{-}b) - (C\text{-}a)$

These equations must be rearranged for external work and, when a quantity of parts must be checked, it is usually best to use two height gages each having an indicator set to the most convenient position. *R H Fry, Croydon, England*

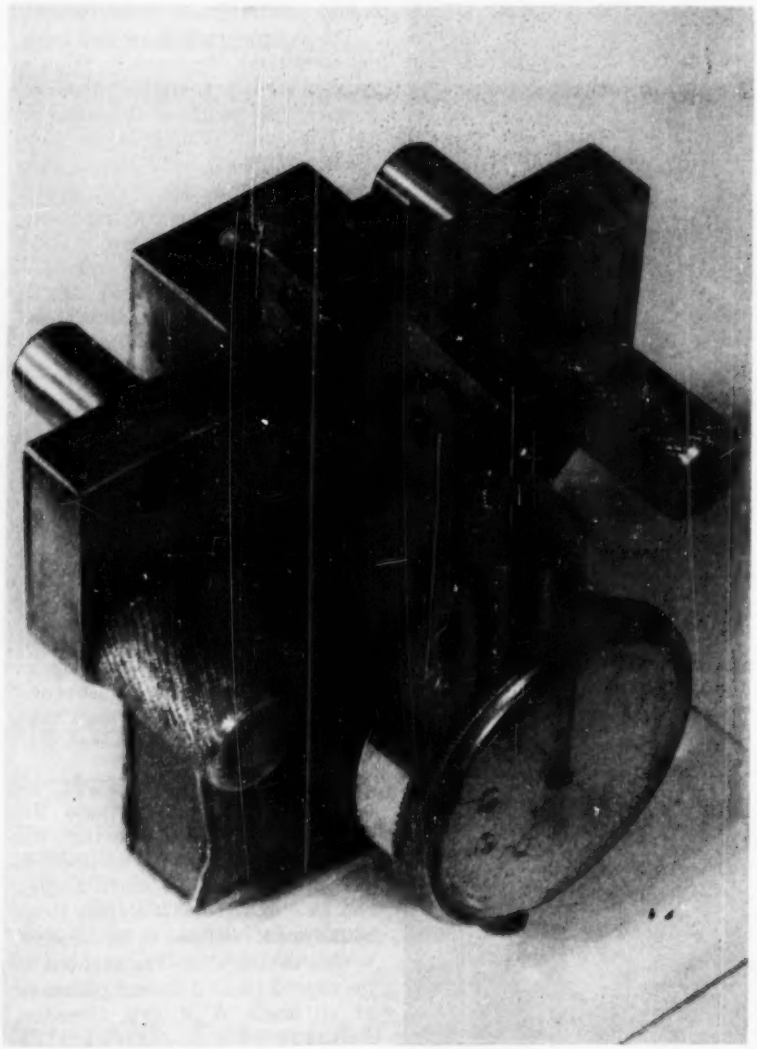


Parts Oversize for Comparator Checked With This Fixture

It frequently happens that oversize parts that would normally be checked with a scaled up drawing on the optical comparator are too large for the screen. As shown, it is possible to check these parts accurately and quickly by using a lightweight fixture. This aid is made with as many datum edges and locating holes and slots as are necessary to expose the critical points. By moving the fixture and drawing around on the projector table, each section can be checked in turn. This technique is not confined to flat objects; is also useful when the sections to be viewed lie in different planes or at an angle. *R H Fry, Croydon, England*

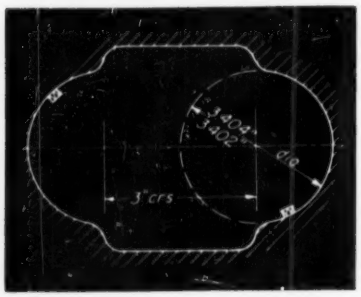
"Set-Up Piece" Saves Time On Later Reorder Tooling

Pieces made on a turret lathe from bar stock can be readily set up for reorder if the operator leaves one piece nearly cut off but still on the bar. A circle is scribed on the bar to denote collet position. Then drawings, bar, and tools are turned in to storage. The bar containing the set-up piece and the special tools are rust-proofed and labeled. This can be done by dipping in rustproofing liquid or by wrapping in vapor-phase inhibited paper. The label contains all job particulars. *N Palmer, Paddington, Australia*



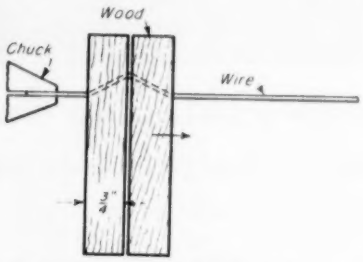
Measure Half-Bores With Sine Principle Bore Gage

Considerable difficulty was found in measuring the diameters of two half-bores in the housing of a hydraulic gear-pump manufactured in our shop. As each bore extends through less than half of a circle, conventional gaging was not suitable. The gage shown was designed to overcome this problem; it enables us to get bore diameters quickly and accurately.



This gage design is based on the fact that the sine of 30° is 0.5. By arranging the center distance of the pins so that contact with the half bores is at 30° to the horizontal for a nominal size bore, any increase in diameter moves the gage body twice as far as the central registering plunger. By incorporating the 2:1 lever advantage and the indicator reading for the increase in diameter plus the direct diameter increments, the size is obtained.

This gage, actually a comparator, is present with either a standard setting ring or slip gages. Accuracy falls off as the contact angle changes from 30°, but for variations of 0.020 in. dia from standard bore size the readings are sufficiently accurate for the limits required. *A Whiteley, Yorkshire, England*

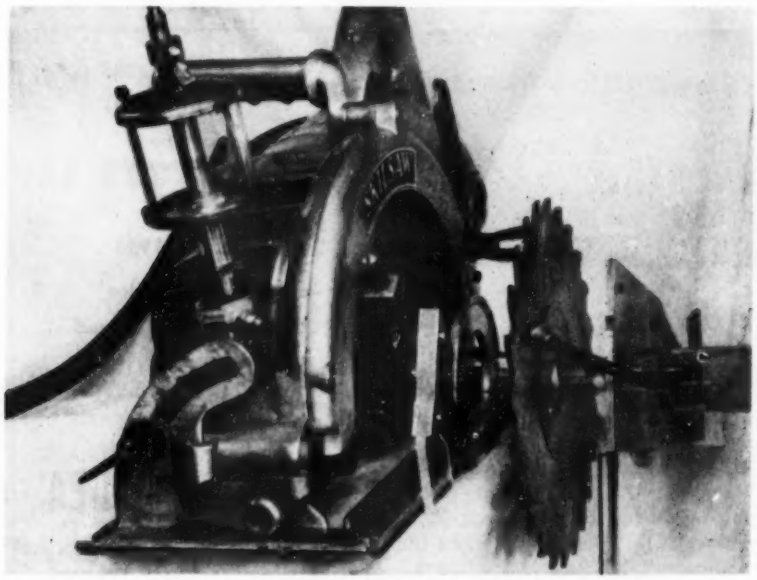


Coiled Wire Straightened By Using Wooden Blocks

Wire that is approximately 1/16 in. to ⅛ in. dia can be straightened by using two pieces of hardwood. Holes having a diameter roughly 0.010 in. larger than the wire are drilled at an angle through the blocks as shown. The angle is from 20° to 30° and, corresponding to the quantity of work, a number of paired holes should be prepared in advance.

Cut the wire into pieces about 3 ft long—the thinner the wire, the shorter the piece—then pass one end through the wooden blocks and chuck it in the lathe. As the wire is revolved at between 500 and 800 rpm, the two pieces of wood are pressed together by hand and slowly moved to the opposite end of the wire, which is loosely held by hand. It is advisable to oil the wire before the operation. *B Erteschik, Birmingham, England*

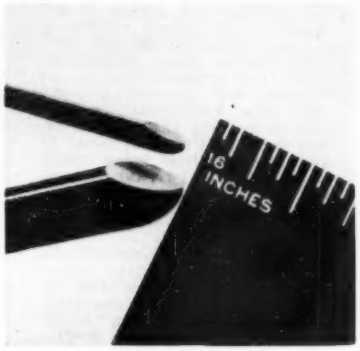
Ed. note: Continuous coiled wire can also be straightened by passing it through a piece of tubing having a V-bend in the center similar to the hole in the wood. Tubing is collet-held and power rotated.



Wax Lubricant Improves Sawing Of Aluminum Alloy Sheet Stock

The wax lubricating attachment shown adapted to an 8-in. Model 87 Skilsaw makes it possible to cut up to 1½ in. thick 61S-T6 aluminum alloy and provide an exceptionally good surface finish. Two fixed washers are rigidly mounted on the saw frame concentric with the axis of rotation and spaced 0.025 in. away from the saw blade.

Johnson's Liquid No. 150 wax is diluted with an equal quantity of water and fed from a drip-feed oiler through a ⅛-in. dia copper tube to the center of each washer. As the saw rotates, a thin film of wax is spread over the entire surface of the saw blade and out to the edge. Thus, all traces of galling and binding experienced with dry cutting are eliminated. A Simonds 24 chisel tooth blade is used for the 1½-in. thick plate. *C J Filz, Oregon State College, Corvallis, Ore*



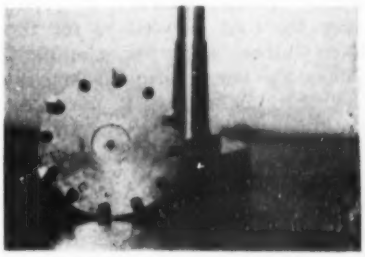
Accurate Reamer Uses Half-Drill Principle

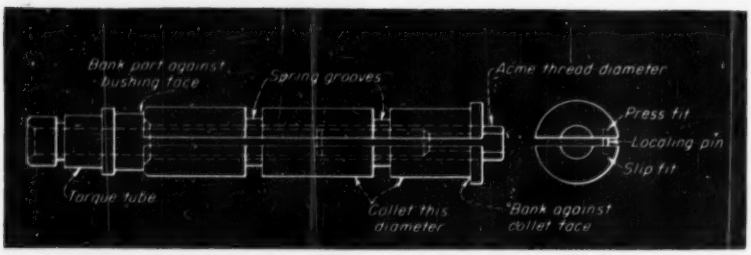
For small holes requiring precise diameters, the reamers shown are easily and cheaply made; give precision results. Usually manufactured from drillrod, we harden about 1 in. of one end to R.60-65. Then we polish this hardened end to the exact diameter of the required hole. After heat-treating and polishing, the cutting end is ground to an acute angle of approximately 15°.

This reamer should be operated at fairly high speed, at least twice as fast as a drill of the same diameter, and cooled with oil. For thin sheets such as clock plates, these tools are excellent. Blind holes for dowel pins can be reamed with parallel sides to full depth. When dull, the reamer can be reground to its original condition by taking a light cut across the cutting face. It does not chatter and performs in the jig borer better than a fluted reamer. *Walter G Holmes, Minneapolis, Minn*

Homemade Facemill Gives Good Surface Finish

Here is a tool that we have used for two years for machining cast iron. While it gave excellent results with CI, it did not work well with steel; caused chatter and a poor surface. However, at higher speeds and with soft carbide toolbits, it might prove satisfactory. The tool consists of a steel disk containing a shank at its center and into which is drilled twelve holes. Taper toolbits are driven into six of these holes, alternately spaced. A seventh toolbit is shaped for a finishing cut and is driven into another hole. When the toolbits become too short, they are replaced in the plate. A slot is provided at the front of each hole to provide an index for grinding the bits. We produce the bits on a turret lathe, from hss stock, using negative cutting tools. By using a heavy plate and high surface speed, this tool should cut aluminum without trouble. *Roger Vicoire, Brussels, Belgium*





Split Bushing Collet Adapter

Most shops at one time or another are faced with the problem of boring spline diameters or acme thread diameters in the end of a torque tube opposite the sleeve or flanged end. On a hand screw machine, this setup requires that a three-jaw universal chuck be mounted, equipped with soft jaws, and the latter bored to fit the torque tube. In chucking the part, the flanged or sleeved end is placed into the chuck first, then the jaws are clamped on the nut or spline diameter. This operation is slow and costly. In most cases it can be improved at small cost to show at least a 30% increase in production.

The split bushing collet adapter shown will, usually, eliminate the slower chucking method. Two points must be stressed in making the tool:

1. Close concentricity tolerance between the ID and the OD of the part requires close concentricity between the ID and the OD of the bushing.

2. The major diameter of the part must not exceed the chucking diameter of the bushing.

In addition to eliminating the chuck setup and boring soft jaws, this adapter eliminates the hexagon turret stock-stop step and the part is automatically located by banking it against the shoulders. *Harold D Rhodenbaugh, Grand Rapids, Mich*

Liquid-Tight Metal Boxes

When liquid-tight boxes or tanks are required in sizes not available from stock, brass or tinplate is commonly used to permit soldering the joints. However, for some applications aluminum is preferable and this material has the disadvantage that joining requires special skill. If a folded joint can be allowed, then the tank can be made simply and quickly. The technique makes a better box, even with materials like brass.

First, form the lengthwise bends using boards to bend over the fold as well as for the form block and for clamping. Shape the wood form block to fit the channel snugly. It may run the full length or just long enough to back up the strips on the outside and between the clamp jaws. This inner form block is spaced in from the end of the channel a distance equal to the height of the finished box. Then the outer strips are aligned with the inner block and the setup is securely clamped. Folding is done as if the form block were a parcel being wrapped in paper.

However, the folding line for metal must be figured and marked in advance. The fold in the surplus metal will fall along the diagonal from the bottom corner of the inner block to the free upper corner of the metal sheet. Lay a rod, preferably tapered, along this line and gradually hammer it outward. Working both sides in this way will bring up the end flap which is then hammered flat against the block and the ears are hammered in flat against the sides. Tungsten boats for high temperature work can be made in this way. *W D Arnot, England (No address given)*

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Allan Clarke
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PAYMENT—**$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.**

JUDGES — **A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.**

REQUIREMENTS — **Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.**

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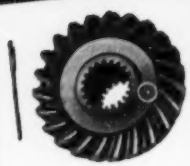
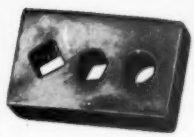
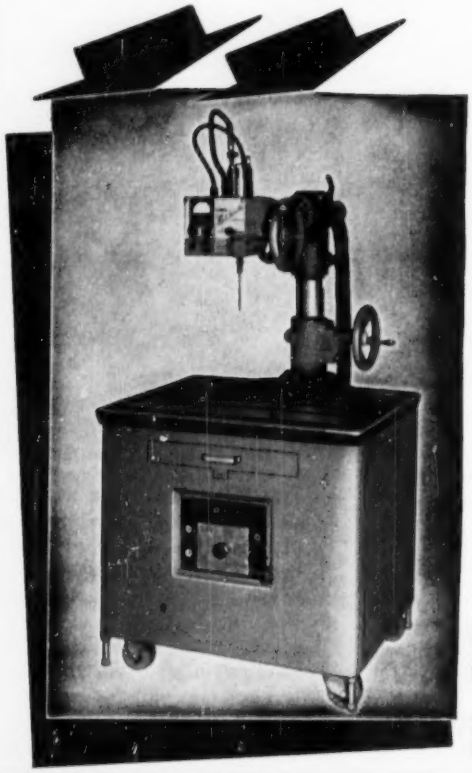


Cut oil holes in hardened gears without annealing

Cut dovetails in hardened dies



Cut any shape hole in cemented carbides



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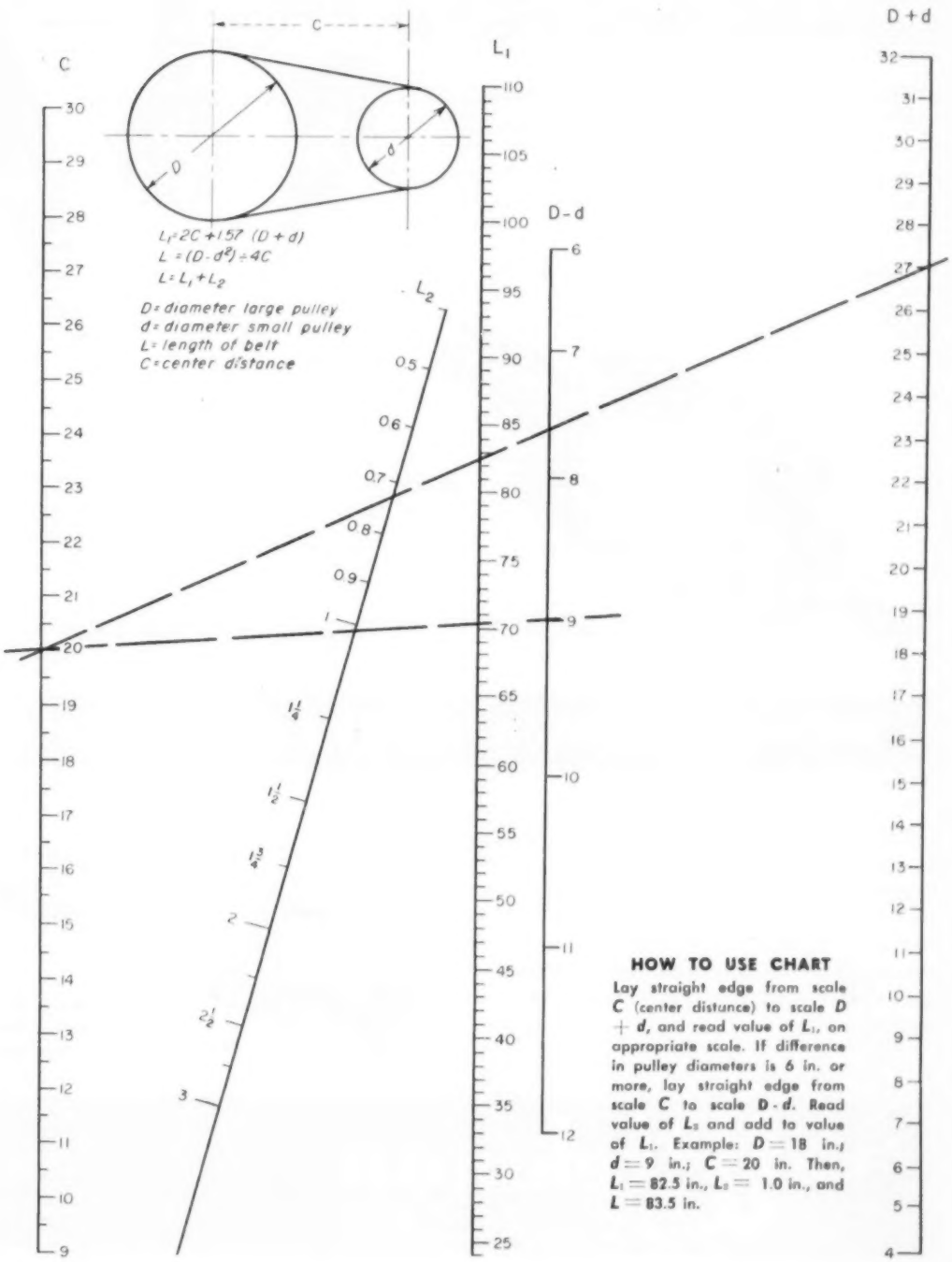
BY D. E. SWEET



HOW TO USE CHART

Lay straight edge from scale **C** (center distance) to scale **D + d**, and read value of L_1 on appropriate scale. If difference in pulley diameters is 6 in. or more, lay straight edge from scale **C** to scale **D - d**. Read value of L_2 and add to value of L_1. Example: **D** = 18 in.; **d** = 9 in.; **C** = 20 in. Then, L_1 = 82.5 in., L_2 = 1.0 in., and **L** = 83.5 in.

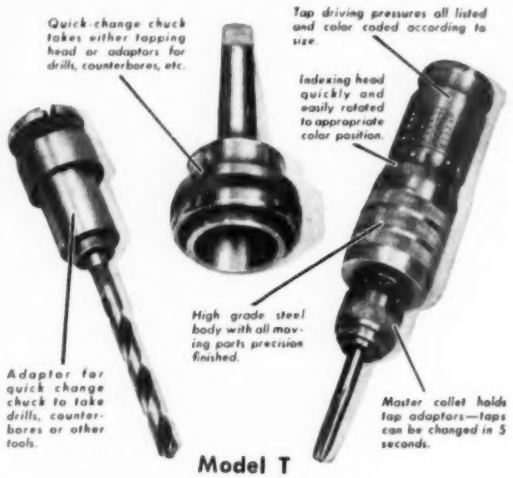
WICKMAN TAPPING ATTACHMENTS
Instant Pre-Selection of Tapping Torques

Pre-selected tapping torques are instantly obtained by presetting the pressure on a two tooth clutch to the required tap size. This is done by means of a highly resilient pressure unit which allows the clutch to slip when tap is overloaded.

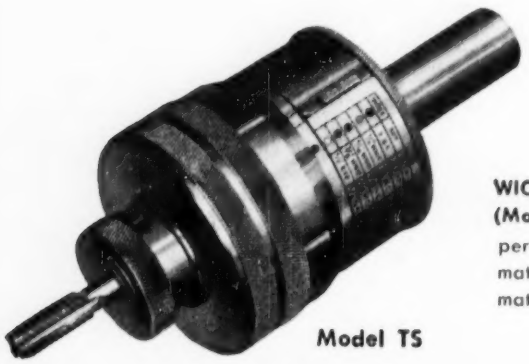
WICKMAN HIGH SPEED TAPPING ATTACHMENTS (Model K) are furnished with Morse Taper Shank attached as an integral unit. Special shanks are furnished on request.

WICKMAN COMBINATION TAPPING ATTACHMENTS (Model T) are designed to fit readily into or be removed from their quick-change chuck even while machine spindle is running. Wickman adaptors for holding drills, counterbores or any other tooling required for your operation can be inserted in the same chuck.

Models K & T sizes and range: from 1/16" to 1 3/4".


Quick-change chuck takes either tapping head or adaptors for drills, counterbores, etc.
Tap driving pressures all listed and color coded according to size.
Indexing head quickly and easily rotated to appropriate color position.
High grade steel body with all moving parts precision finished.
Adaptor for quick change chuck to take drills, counterbores or other tools.
Master collet holds tap adaptors—taps can be changed in 5 seconds.

Model T



Model TS

WICKMAN TAPPING ATTACHMENTS FOR TURRET LATHES (Model TS) are considerably shorter than Models K & T. They also permit presetting of tapping torque required for any tap size or material, thus preventing tap breakage in blind hole tapping or materials difficult to tap.

Model TS sizes and range: from 3/16" to 1".

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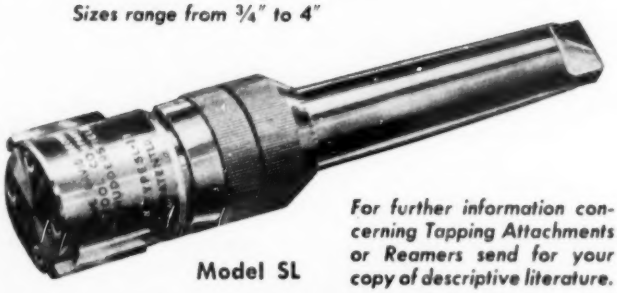
Equipped with fully floating blades and direct reading micrometer adjustment, Wickman-Brown Reamers do not require special tools for setting. Reamers may be operated rotating or stationary and are furnished with either high speed or carbide tipped blades.

Wickman-Brown Reamers assure absolute accuracy, complete concentricity and superfine surface finish on both through and blind hole reaming.

Sizes range from 3/4" to 4"



Model SL

For further information concerning Tapping Attachments or Reamers send for your copy of descriptive literature.

THE Wickman MANUFACTURING CO.
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American Machinist

REFERENCE BOOK SHEET

Buttress Screw Threads... I

A proposed American Standard to be published by the American Society of Mechanical Engineers, New York, N Y

The buttress form of thread has advantages in applications, generally thrust purposes, involving exceptionally high stresses in one direction only. In collecting data on use of buttress threads by industrial and military designers, it was found that the pressure flank angle, measured in an axial plane, ranged from 0° to 15° from the normal to the axis, and that the trailing flank angle varied 30° to 55°. It was decided to adopt a pressure flank angle of 7°, which closely approaches the static angle of friction for well-lubricated steel surfaces in contact, and a trailing flank angle of 45°.

Similar angles are accepted in the proposed British standard, but their standard will be based on 0.4*p* thread engagement, whereas the American standard accepts 0.6*p* thread engagement.

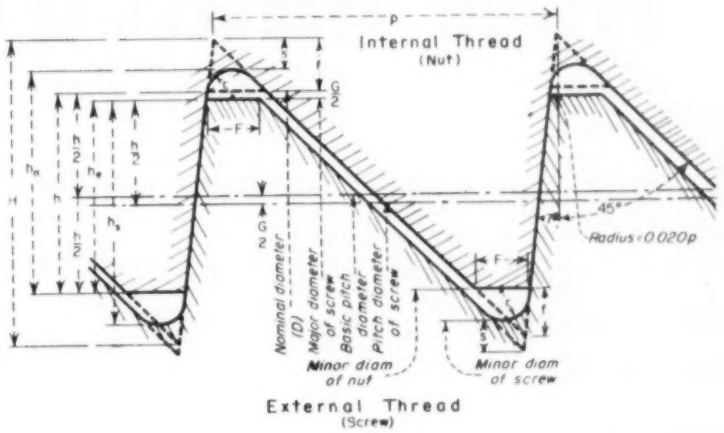
The buttress form of thread is particularly suitable where tubular members are screwed together. Because the thrust side of the thread is nearly perpendicular, the radial component of thrust is reduced to a minimum.

Basic Form of Thread. The basic form of the buttress thread has the following characteristics:

(a) A pressure flank angle, measured in an axial plane, of 7° from the normal to the axis;

(b) A trailing flank angle, measured in an axial plane, of 45°;

(c) Equal truncations at the crests of the internal and external threads such that the basic depth of engagement (assuming no allowance) is equal to 0.6 of the pitch;



(d) Equal radii at the roots of the internal and external threads tangential to the pressure flank and the trailing flank;

(e) Crest corners of external thread broken to approximately a radius of 0.02 of the pitch.

Preferred Diameter Series. It is recommended that the nominal major diameters of buttress threads be selected wherever possible from 20 geometric series:

INCHES				
½	1⅛	2½	5½	12
9/16	1¼	2¾	6	14
⅝	1⅜	3	7	16
11/16	1½	3½	8	18
¾	1¾	4	9	20
⅞	2	4½	10	22
1	2¼	5	11	24

Preferred Pitch Series. It is recommended that the pitches of buttress threads be selected from 10 geometric series:

THREADS PER IN.		
20	6	2
16	5	1⅛
12	4	1¼
10	3	1
8	2½	

The following suggestions are made regarding suitable associations of diameters and pitches:

DIAMETER RANGE (IN.)	ASSOCIATED PITCHES (THREADS PER IN.)
From ½ to 11/16	20, 16, 12
Over 11/16 to 1	16, 12, 10
Over 1 to 1½	16, 12, 10, 8, 6
Over 1½ to 2½	15, 12, 10, 8, 6, 5, 4
Over 2½ to 4	16, 12, 10, 8, 6, 5, 4
Over 4 to 6	12, 10, 8, 6, 5, 4, 3
Over 6 to 10	10, 8, 6, 5, 4, 3, 2½, 2
Over 10 to 16	10, 8, 6, 5, 4, 3, 2½, 2, 1½, 1¼
Over 16 to 24	8, 6, 5, 4, 3, 2½, 2, 1½, 1¼, 1

Basic dimensions for each of

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Buttress Screw Threads... II

the foregoing pitches are tabulated.

Tolerances. Tolerances on external threads shall be minus, and on internal threads shall be plus.

TOLERANCES ON PITCH (EFFECTIVE) DIAMETER. The following formula is used for determining pitch diameter tolerances:

Class 2 (Medium) Pitch (Effective) Diameter

$$\text{PD tolerance} = 0.002\sqrt[3]{D} + 0.00278\sqrt{L_e} + 0.00854\sqrt{p}$$

where D = major diameter of thread
L_e = length engagement
p = pitch of thread

It is to be borne in mind that this formula relates specifically to Class 2 (medium) tolerances. Class 3 (close) tolerances are 2/3 of Class 2 (medium) tolerances, and Class 1 (free) tolerances are 1½ times Class 2 (medium) tolerances.

If the length of engagement is taken as 10p, the formula can be further simplified to:

$$0.002\sqrt[3]{D} + 0.0173\sqrt{p}$$

TOLERANCES ON MAJOR DIAMETER OF EXTERNAL THREAD AND MINOR DIAMETER OF INTERNAL THREAD. As each of these diameters may be used as a datum for measurement of thread angles and pitch, hold them to close limits.

TOLERANCES ON MINOR DIAMETER OF EXTERNAL THREAD AND MAJOR DIAMETER OF INTERNAL THREAD. It will be sufficient in most instances to state only the maximum minor diameter of the external thread and the minimum major diameter of the internal thread without any tolerance. If for any reason a tolerance is considered desirable it should be larger than but not more than twice the pitch (effective) diameter tolerance.

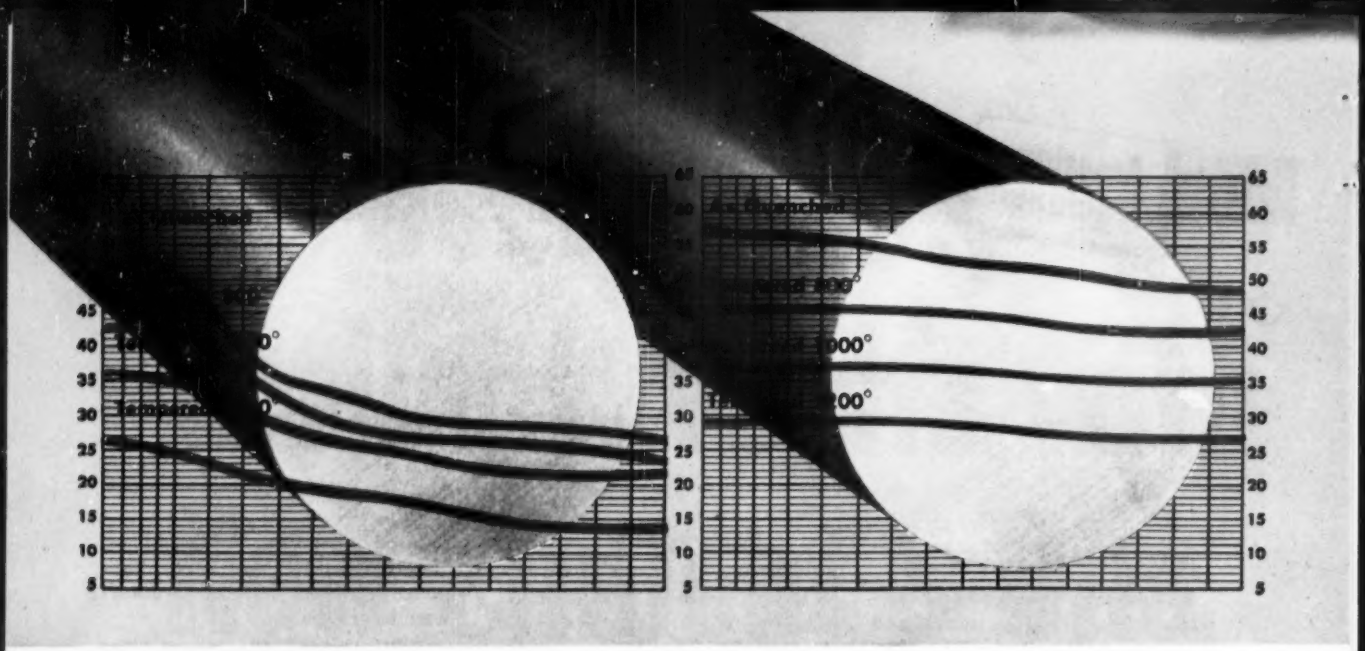
7 Minimum Clearances for Easy Assembly. An allowance (clearance) should be provided on all buttress external threads in order to secure easy assembly of parts. The amount of the allowance should be deducted from the nominal major, pitch (effective), and minor diameters of the external member in order to determine the maxmum metal condition.

The minimum internal thread diameters will be basic.

The recommended allowance is the same for all three classes of fit, and is equal to the Class 3 (close) pitch (effective) diameter tolerance as calculated above.

BASIC DIMENSIONS FOR BUTTRESS SCREW THREADS

Threads per Inch	Pitch, p	Basic Depth of Thread, $h = 0.6p$	Depth of Sharp-"V" Thread, $H = 0.89604p$	Crest Truncation, $f = 0.14532p$	Depth of Thread, h_s or $h_n = 0.66271p$	Root Truncation, $s = 0.08261p$	Root Radius, $r = 0.07141p$	Width of Flat at Crest, $F = 0.16316p$
20	0.0500	0.0300	0.0445	0.0073	0.0331	0.0041	0.0036	0.0082
16	0.0625	0.0375	0.0557	0.0091	0.0414	0.0052	0.0045	0.0102
12	0.0833	0.0500	0.0742	0.0121	0.0552	0.0069	0.0059	0.0136
10	0.1000	0.0600	0.0891	0.0145	0.0663	0.0083	0.0071	0.0163
8	0.1250	0.0750	0.1113	0.0182	0.0828	0.0103	0.0089	0.0204
6	0.1667	0.1000	0.1484	0.0242	0.1105	0.0138	0.0119	0.0271
5	0.2000	0.1200	0.1781	0.0291	0.1325	0.0165	0.0143	0.0326
4	0.2500	0.1500	0.2227	0.0363	0.1657	0.0207	0.0179	0.0408
3	0.3333	0.2000	0.2969	0.0484	0.2209	0.0275	0.0238	0.0543
2½	0.4000	0.2400	0.3563	0.0581	0.2651	0.0330	0.0286	0.0653
2	0.5000	0.3000	0.4453	0.0727	0.3314	0.0413	0.0357	0.0816
1½	0.6667	0.4000	0.5938	0.0969	0.4418	0.0551	0.0476	0.1088
1¼	0.8000	0.4800	0.7125	0.1163	0.5302	0.0661	0.0572	0.1305
1	1.0000	0.6000	0.8906	0.1453	0.6627	0.0826	0.0714	0.1632



Same Alloy...but *What a Difference!*

Graphic Reason for Using Ryerson Certified Alloy Steel

Here are two bars of alloy steel recently purchased by a metalworking company. Both are the same type of alloy—AISI TS 4140 annealed. And both are high quality steels with chemistry meeting all the requirements of the specification.

But look at the difference revealed by hardenability tests!

The tempered-at-800° curves are typical. For the bar at left this curve starts at 44 Rockwell C and ends at 24. For the bar at right the same curve starts at 45—ends at 42. And the differences in hardenability naturally reflect equally marked differences in the mechanical properties that can be obtained from each bar.

Yet remember both bars are the same alloy and therefore are often expected to react in the same way. Their differences are only the normal variations that occur between different heats within the same specification.

That's why it is so important for you to specify and buy Ryerson Certified Alloys. *Every heat* of as-rolled and annealed alloy steel from Ryerson has been tested for hardenability in our own laboratory. When you receive a shipment of Ryerson alloys you also receive a Ryerson Alloy Certificate which shows exactly how *your particular heat of steel* responded to those tests. And the Certificate interprets the test results for you in terms of mechanical properties.

Thus you know the actual—not just the theoretical—hardenability of your alloy steel from Ryerson. And you know exactly how to heat treat that steel to obtain the desired properties. So why guess at hardenability? Use Certified Ryerson Alloys and be sure.

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TALKING SHOP

Repeat Patterns

COUPLE years back, a reader asked us to work out for him the spacing between centers of a circular pattern repeated ten times on a 2-in. plastic sphere. Have you ever tried this one? If not, you're in for a surprise. It can't be done—at least we couldn't do it, not with uniform spacing.

As we figure the thing out, you could spot uniformly spaced patterns over any sphere only in certain combinations, and the locations in those cases can be determined graphically. The trick is to inscribe within the sphere a regular geometric figure. Thus, after two locations, you jump to four—not the four directions, but the points of a regular triangular pyramid. As we visualize it, five points are not obtainable — they would be the corners of a regular square pyramid with slant height equal to the base. But such a figure couldn't be inscribed in anything but a hemisphere. This leads us to the next possibility—6 points—obtained with an octahedron, or double square pyramid, giving in effect the two poles and four directions. Next is eight points—the corners of an inscribed cube. From there, we go to 14—the next regular inscribable polygon. Disagree?

Paktong

THE CHINESE first produced nickel silver, calling it "paktong," which meant "white copper." This alloy of nickel, copper and zinc was later known as German silver. The name was changed during World War I. Nickel, incidentally, was first known as "Kupfer-Nickel," or "Old Nick's Copper," because when it was found first in 18th Century copper ores in Saxony it resisted hammering into useful articles. Superstitious miners thought the devil had cast a spell over it. The first nickel coin, a 20-centime piece, was minted in Switzerland in 1831.

Copy Flies

ON JULY 27, I Zorich, tool designer of Kelvinator, Ltd, South Australia, sent us a Reference Book Sheet, "Time for Screw-Machine Parts." Aug 11, the editor handling the job wrote Mr Zorich for more data, which he sent Aug 18. The page appeared Sept 14 (p 181)—which all goes to show that air mail makes editors' lives much easier. In the old days, each letter would have taken several months.

Pedestals to Order

ONE OF the world's largest boring mills, a 42-footer, in the plant of S Morgan & Co, York, Pa, has a feature we have never seen before. Because the height of the large hydraulic-turbine components the company builds varies over a wide range, the machine rail is mounted on pedestals of varying height. When a change in height is needed, the entire rail is picked up by the shop crane by means of a special built-in yoke, the present pedestals removed, and new ones substituted. Then the rail is replaced. The machine is a composite job; the table and drive were designed and built by Smith, the rail and heads by Consolidated.

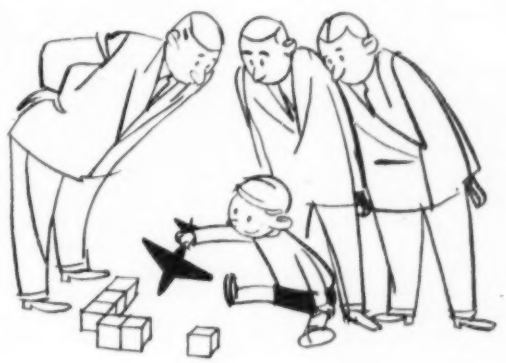
Irons and Iron

THE COOPER UNION, New York college, celebrated on Sept 17 the 100th anniversary of the laying of the cornerstone of its Foundation Building, oldest US building supported by rolled structural beams. The first semi-fireproof structure in New York, the building actually was not completed until 1859. Peter Cooper rolled the first wrought-iron beams at that time at Trenton Iron Company. They were of essentially railroad-rail cross-section, and were so much in demand that the first beams earmarked for the building were sold to other customers, including the US Treasury. Peter Cooper applied the profits to produce a better building, and the delay also helped, because of lowered prices as a result of the intervening panic of 1857.

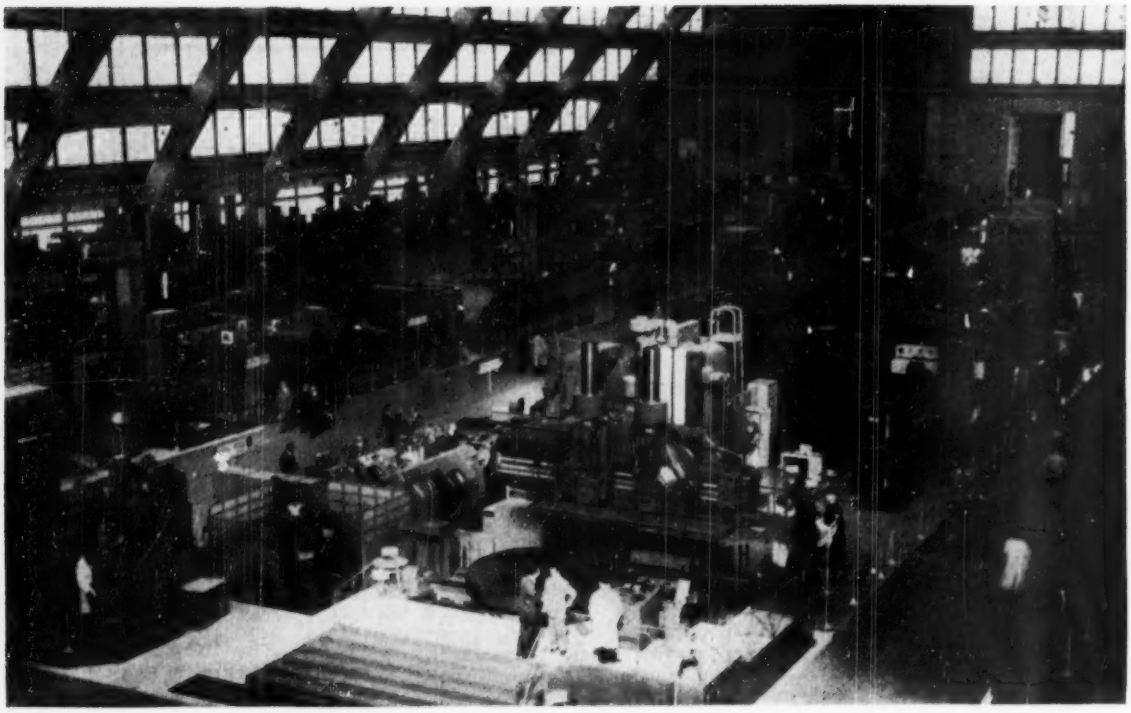
In this building, Lincoln delivered his famous "Right is Might" speech in 1860. The Great Hall, with air supplied by a steam-driven fan, was America's first ventilated auditorium.

3-D Toyland

AVRO has begun production of 600 CF-100 Mark IV fighters at Malton, Ont, near Toronto. And gathering dust is a $22,000 3-dimensional model that was used in planning the changeover in production lines. This model, called "toyland," is credited with cutting planning time two thirds in changing from the Mark III—a job that required 15,000 new tools, jigs, fixtures, and templets. It would have taken 40 to 50 draftsmen five to six months to plan the relocation moves without the 3-D model. The model is a ¼-in.-to-the-foot scale job of the entire plant (1.5 million sq ft). Engineers and shop men simply gathered around it and pushed the models around until they were satisfied. It saved costly errors, eliminated bottlenecks, improved production and assembly lines. In one case, for example, wing jigs were planned to go in one corner, but the 3-D model supported a foreman's opinion that they wouldn't go in under the crossbeams.



News of Metalworking



Third European Machine-Tool Exhibition

BRUSSELS—Almost 3000 machine tools were exhibited here by some 770 firms representing 14 nations at the Third European Machine Tool Exhibition, Sept 4-13. Germany, as it did at the Hanover show last year, dominated the exhibition with the products of 318 machine-tool firms, occupying 45% of the exhibit area.

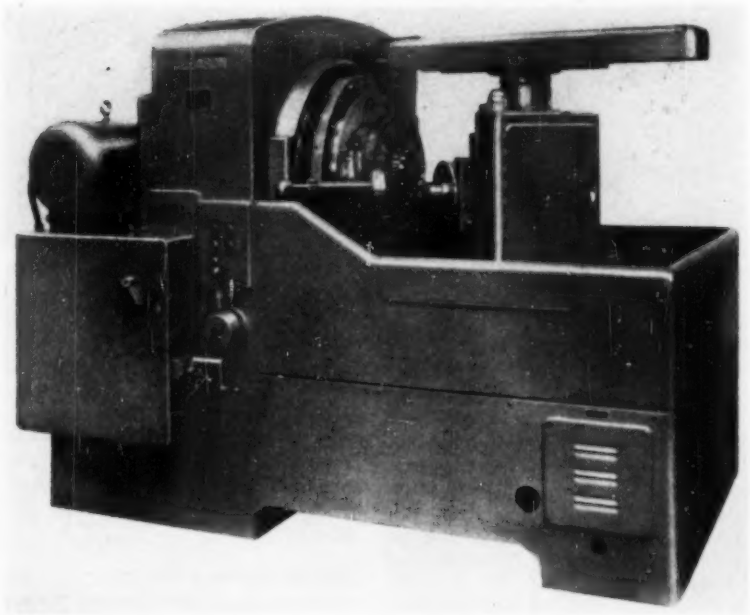
France was second in number of exhibits with 121, followed in order by Switzerland with 65, Belgium 57, Italy 57, Great Britain 43, United States 25, Sweden 24, the Netherlands 21, Austria 11, Spain 2, Lichtenstein 2, Denmark 1, and the Saar 1.

New Machines Fewer

New machines were not as much in evidence as they were at the Second European show in Hanover last year. Nevertheless, some highly unusual machines were on display. Among them: two British-made units for spark machining; a German gear hobber with pneumatic programming; a Swiss internal spline grinder with grinding wheel driven by a jet of high-pressure coolant impinging on a turbine wheel; and a German two-crankshaft deep-drawing press that provides constant draw speed, quick reverse. USA's Gleason Works unveiled five machines for the first time at the Brussels Show—two gear cutters and three inspection units.

New Trends Noted at Brussels:

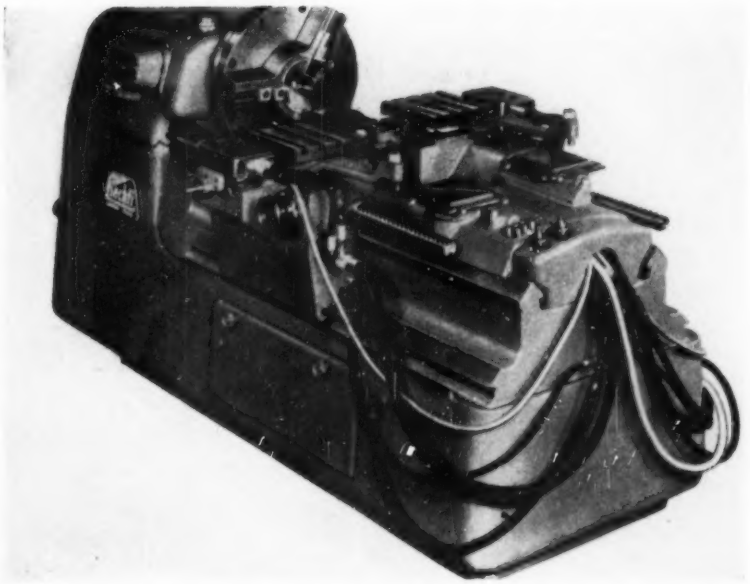
- Majority of exhibiting-lathe makers featured copying attachments, and special copying lathes. Some of the lathes shown have two independent copying slides, one with roughing tool and the other with finishing tool. Internal and external cuts can be taken at the same time—or both attachments can operate on different parts of the work simultaneously.
- Automatic sizing is gaining. Pneumatic devices for this purpose were much in evidence. But electric and electronic equipment is holding its own. Most devices are combinations of two or more methods, i.e, electric-hydraulic.
- Spindle speeds seem to be leveling off, now that the normal maximum for carbide cutting has been reached on many machines. Increases largely consist of bringing up the average to, or nearer to, that of the highest.
- Spark machining was on display in Europe for the first time. Machines for electro-erosion by the spark technique were displayed by two British firms—Wickman, Ltd, and Impregnated Diamond Products, Ltd. Both are licensees of Sparkatron, Ltd. Equipment can be applied to conventional machine tools.
- Levers and hand wheels are rapidly being eliminated in favor of electric controls. In fact, automatic controls have advanced in Europe even since Hanover.
- Some machines had features that seemed almost deliberately clever. But others showed that builders recognize the undesirability of overelaborate design and have simplified their previously elaborate machines accordingly.
- Grinding machines were much in evidence. Here, the trend is toward measurement of work at the machine. One transfer machine is equipped with an automatic inspec-



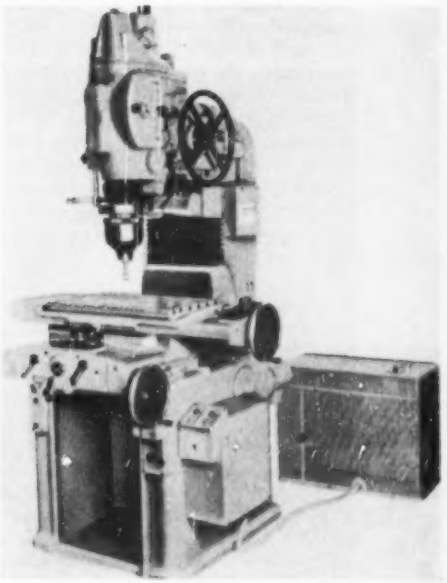
GLEASON NO. 106 HYPOID GENERATOR cuts spiral bevel, hypoid and Zerol bevel gears at speeds ranging from 84 to 380 fpm. Automatic cycle is controlled by two cams: (1) feed cam for depth motion, and (2) actuating generating roll

HEES CAPSTAN LATHE with plug-in electric programming, 16 spindle speeds up to 3200 rpm

Makes Brussels Showcase for 14 Nations



LEICHTI PRODUCTION LATHE FOR LARGE CHUCKING WORK, copying and bar work, is built-up from standard independent units that are readily interchangeable. Main drive from 30 hp motor has pneumatic disk clutches to provide 10 to 1 speed reduction. Unit has 12 speeds, 16 feeds—all air-operated



HAUSER JIG GRINDER, Type SM, has high-speed motor to give spindle speeds of 16,000-50,000 rpm, controlled by independent frequency converter

tion device. At least five builders showed units with pneumatic gaging equipment for machine control.

• Gaining ground rapidly: electric, pneumatic and optical equipment for on-the-job production inspection; air-under-pressure as a measuring medium.

• Electromagnetic clutch devices are on the increase—with ingenious emphasis on spindle and slide drives. Also getting more attention: mechanical drives in conjunction with variable-speed motors and electro-magnetic clutches.

• Bed angle on various European machines range through 90° from horizontal to vertical. One copying lathe has a vertical bed, another a bed 30° to the vertical, another an overhead bed.

Exhibits of Interest

• HEB copying lathe (French) featuring automatic rapid return of saddle by an independent ½ hp motor. Top spindle speed: 3600 rpm. Pendant control panel saves operator's time.

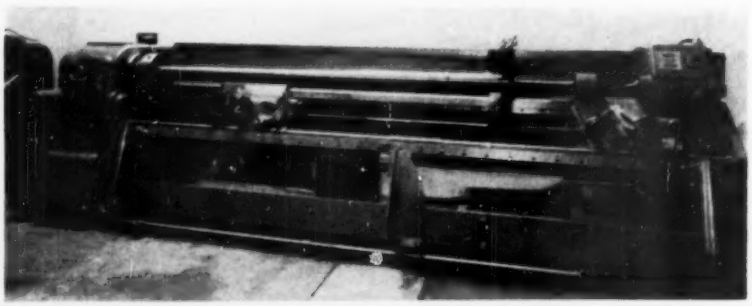
• Muller (German) combination tool try-out press and small radial drill, permitting drilling, reaming and tapping without removing tools from press.

• German machine for trimming and cutting long lengths of sheet metal has a circular upper blade on carriage traversed along guideway above the work. Upper blade carriage is pulled by endless chain driven by electric motor through a gear train. Sheet is held against lower blade by pneumatic hold-downs.

• Maxnovo (German) duplicating lathe with two independent tool slides, both equipped with tracer and templet holder, allowing them to simultaneously follow different paths. Machine is principally for chucking work.

• Schaerer (German) profile copying attachment with adaptation for non-circular cross-section profiled work. Hydraulic copying arrangement does any kind of longitudinal and cross-copying work.

• Strasmann-Enke (German) double-table rotary surface grinder has two rotary magnetic tables carried on knees in front of bed. Sliding on top of bed is a grinding head with vertical spindle. Head can be traversed over each of the tables in turn—one table can thus be unloaded and reloaded while work is being ground on the other table. Grinding thus proceeds almost continuously.



GEORGE FISCHER COPYING LATHE handles turbine shafts, gun barrels, and similar work up to 140-in. long. Machine can be equipped with two feed carriages and copying slides and may be used for internal copying

• One machine shown at Brussels overcomes the need for using a different pair of cylindrical thread-rolling dies for differing work diameters, even when thread pitch is the same. Machine has swivel mountings for the rolls, enabling them to be swung to any helix angle. Rolls have annular ribs like a thread-grinder wheel.

• Sentinel Cri-Dan (British) semi-automatic high-speed threading machine is also designed for turning, boring and facing at a single loading, and can do other operations simultaneously with thread turning.

• Pittler (German) turret lathe machines bar stock up to 3.15-in. diameter collet capacity, can be extended to 4.01-in. diameter when short stock is used. Large stock with swing up to 22.8-in. diameter can be machined within 6-8 ISA tolerance. Work spindle is in front of machine axle, and spindle speeds and feeds can be changed automatically as indexes by means of programming device.

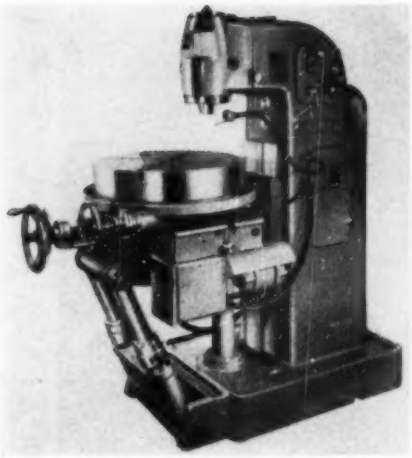
An Impressive Showing

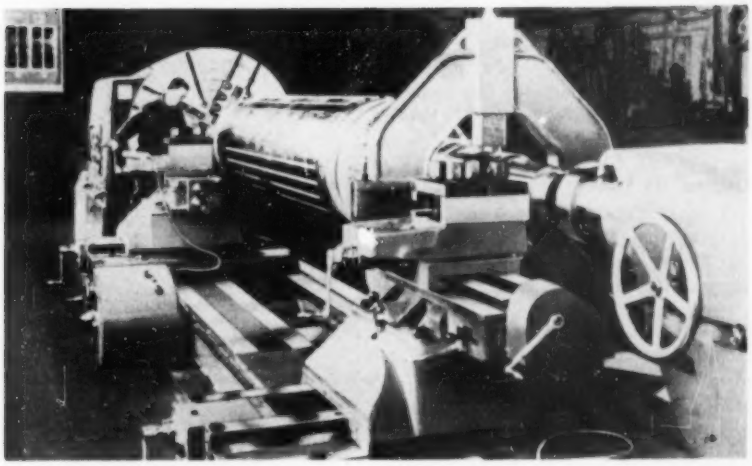
All in all, the show was an impressive one, with more than a third-of-a-million sq ft of space given over to display of Europe's newest machine tools. But because of a lack of crane facilities, elephant machine tools were not as much in evidence as at Hanover last year.

Individual exhibits, too, were impressive. Show's largest was that of

(Continued on p168)

BRITISH MACHINE TOOL MEN at Brussels included, from left: T N Woof, sales director, Burton Griffiths & Co; Alfred Neate, deputy director-general machine tools Ministry of Supply; R D G Ryder, president, Harry G Potts, vice president, and W J Morgan, general manager, Machine Tool Trades Assn

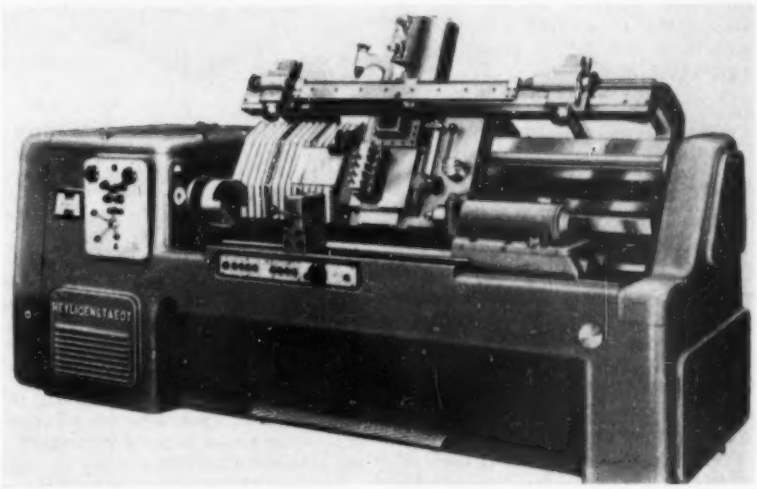


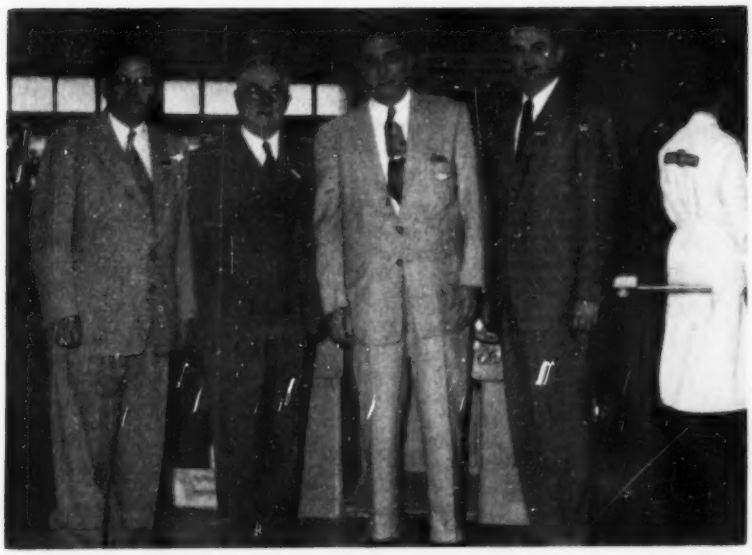


ABOVE: SCHUBERT SAR MILLER has power-driven rotary table for continuous milling, 9 table speeds from 3-65 mm. Cutter spindle speed of 1200 rpm is available for machine

ABOVE, RIGHT: WAGNER LATHE has center height of 40 in., 36 ft between centers. Machine can handle work weighing up to 44 tons. Three-way bed is unusual feature

RIGHT: HEYLIGENSTAEDT's new, smaller version of last year's copying lathe has 6¼-in. swing over slide, against 12½ on earlier machine. Main bed carrying copying slide is at 30° angle





CINCINNATI MILLING MACHINE CO'S EXHIBIT was manned by, left to right: Nelson F Caldwell, export manager; J E Caster, managing director of Cincinnati's British subsidiary; Cincinnati vice president Swan E Bergstrom, president, NMTBA; and European Sales Manager A L Sidak

NATIONAL ACME's sales mgr, Robert Rhodehamel, left, and European representative H W Smith, right, chat with W V Hodgson of Wicksham, Ltd

Forges de Gilly, with 5400 sq ft devoted to display of heavy machine tools. Second in size was Germany's VDF group of lathe makers: third was Germany's Heller.

Largest US Space: Cincinnati

Largest US exhibitor was Cincinnati Milling Machine Co, with 2200 sq ft. Running Cincinnati a close second was Giddings & Lewis.

Next Show—Milan

The Fourth European Machine Tool Exhibition will be held next September in Milan, Italy. And for the first time, the British, who have exhibited extensively at the Brussels and previous shows, will be among the sponsoring nations and will have a voice in planning the 1954 show.

THREE COMPANIES PROPOSE VANCE-TYPE PROJECTS

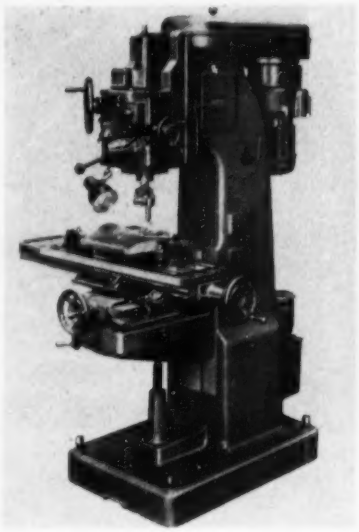
WASHINGTON—Three defense contractors have proposed Vance Plan-type projects to the Pentagon under which the Defense Dept would tool up their plants with reserve production to be kept on standby. Money for this would come from the recently appropriated $250 million Reserve Tool Fund.

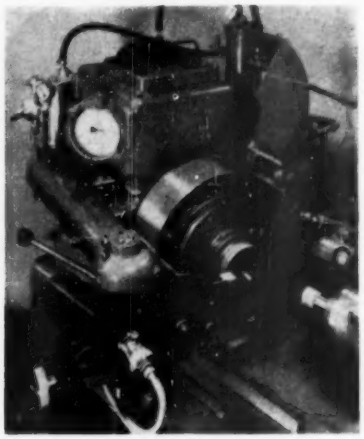
One of the companies is General Electric, whose project would cost about $125 million for reserve electronic production lines. The Army previously asked GE to work up this project.

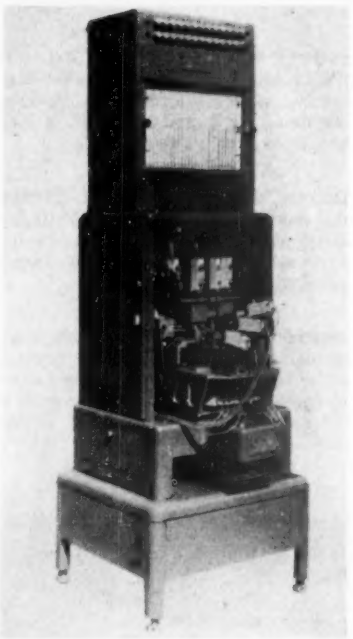
A second project proposal was made at the request of another military service. But the third project, submitted by an auto parts maker, was unsolicited.

Many metalworking companies have asked the National Production Authority how they can get Vance Plan business. But industry's interest is not matched by Pentagon brass, who dispense the fund.

Right now, individual services are planning projects to be financed by the fund. But it's understood that Defense Secretary Wilson wants a thorough inventory of the military's idle production equipment before allocating funds. And it's doubted that the Pentagon's fiscal 1955 budget will call for new reserve tool money. Also, many are skeptical that much of the $250 million will be committed before June 30, 1954.





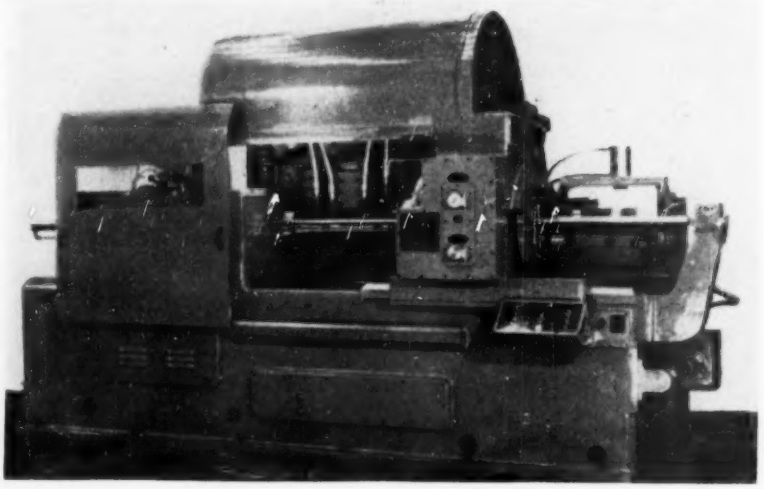


ABOVE: MATHEYS SEMI-JIGBORER uses gage blocks and dial indicators to locate table in two directions, permitting accurate work location without jigs. Air grinder can be used for jig grinding

ABOVE, RIGHT: UVA INTERNAL GRINDER has compressed air gaging device to determine when final size is reached

RIGHT: SIGMA SEMI-AUTOMATIC GAGE checks 22 dimensions on compressor blades with liquid column giving retained readings

BELOW: PROGRESS AUTOMATIC SHELL LATHE designed for roughing 3½-6 in. shells. Loading and unloading is automatic. Automatic cycle provides high-speed production



AMTDA Talks Over Depreciation, Procurement, US Tool Reserves, Sales Outlook at Annual Meeting

WHITE SULPHUR SPRINGS, W Va —Four important factors bearing on the future of the machine-tool industry as a whole were stressed at the 29th Annual Meeting of the American Machine Tool Distributors Association, held here at the Greenbrier, September 14-15. They are:

- Optional depreciation on the right of the buyer of production equipment to amortize his investment at whatever rate he chooses.
- Standardization of machine-tool procurement policies of government agencies, especially the Services.
- The need to sell as never before in an intensely competitive market.
- A sane and reasonable policy of administering government reserves of machine tools so as to preserve government holdings intact and to prevent the surplus problem that plagued the machine-tool industry after World War II.

In line with the latter, NPA Metalworking Equipment Division Director Perrin G March III told the meeting that his Division recommends that government-owned machine tools should be leased for defense purposes only. But an exception might have to be made for heavy machinery that would require dismantling before shipment, and for "package plants" the military wants kept intact for end-item production, he said.

Mr March added that although Vance Plan "philosophy" is being followed, he doubts that "any large portion" of the Vance Plan's $250 million will ever be used for machine tools. Even if machine tools are bought under the plan, it won't be this year, he said.

Though business obviously is off considerably from the boom level of the past two years, AMTDA members expressed reasonable optimism about the outlook.

Thomas R Rudel, president of Rudel Machinery Co, Inc, New York City, was elected president of AMTDA for the coming year. Other new officers: First Vice President R A Vidinghoff, Machinery Associates, Inc, Philadelphia; Second Vice President Henry R Hanson, William K Stamets Co, Cleveland. New Executive Committee members: Frank Habicht, Marshall & Huschart Machinery Co, Chicago; R Everett, Halliday Machinery Co; N W Caldwell, Wigglesworth Machinery Co, Boston; and C J Anderson, Anderson Machinery Co, Minneapolis, who will fill Mr Vidinghoff's unexpired term.

NEW AMTDA PRESIDENT is Thomas R Rudel, president, Rudel Machinery Co, New York

Accelerated write-offs are more clearly understood today than ever before by the nation's legislators, new AMTDA President Rudel stated in reporting for the Government Relations Committee. Such write-offs, he said, will do more than anything else to stimulate sales, particularly in the replacement market, which is very large.

The machine-tool industry must meet competition both at home and abroad, from whatever source, by producing machines of superior design and performance that will give lower cost per piece, Herbert L Tigges, first vice president National Machine Tool Builders Association and executive vice president Baker Brothers, Inc, asserted. Builders, he added, must do a better job of selling than heretofore to offset foreign as well as domestic competition.

Mr Tigges emphasized that our national reserves of machine tools must not be dissipated by indiscriminate leasing. He thinks good progress is being made toward uniform conditions and terms in government procurement contracts. He further believes that the enactment of legislation for rapid write-offs will open new markets for machine tools.

The industry must not relax its efforts to supply machine tools on time to defense contractors, even though the defense production crisis has lessened, Mr Tigges continued. Both NMTBA and AMTDA, representing builders and distributors, have a big job still to do in Washington on behalf of maintaining a healthy machine-tool industry.

Continued high demand for machine tools will defy gloomy forecasts by those who persist in tying the industry to cyclical ups and downs, Eliot Janeway, New York consulting economist, predicted. He relies upon "labor-cost inflation," pressure of competition for lower prices of goods, a backlog of civilian orders accumulated in 1950-52, more liberal depreciation allowances, and new defense tooling programs for support of a "boom" in machine tools.

Mr Janeway said that Russia's ability to penetrate US defenses with atomic weapons will result eventually in the building up of our industries in non-industrial areas, as well as in present locations, as a safety measure. The General Motors fire has taught us that we must have two sources each for civilian goods and for armament items, he concluded.

Retiring AMTDA President John R Riordan urged members to volunteer for temporary duty in Washington, as they did in the Korean crisis. Joel Barlow, Covington & Burling, Washington, led discussion on renegotiation and simplification of procurement rules.

FIRST ALUMINUM SKYSCRAPER, 410-ft high, graces Pittsburgh's Golden Triangle, and appropriately enough, houses the offices of Aluminum Co of America. Exterior walls are sheathed with 6x12 ft aluminum panels

Security Barriers Down as Soviet Bloc Countries Show Machine Tools at Leipzig Fair

LEIPZIG, EASTERN GERMANY (McGraw-Hill World News) — Machine tools held the limelight in displays of all communist countries at the Leipzig Fair, which closed here Sept 9. These exhibits gave some indication of rapid industrial development throughout the Soviet sphere. And Soviet security barriers were obviously down for the Fair—Western European reporters were allowed to roam the exhibit halls at will, writing notes, taking photographs and availing themselves of quantities of descriptive literature.

East German Exhibits

East-German exhibits for the first time reflected emphasis on heavy machine tools, more commonly associated with Western European production. Notable examples: a pair of large crankshaft turning lathes, a gear hobber that handles work up to almost 10 ft diameter, lathes for steel mill rollers, and a double-column planer with a 6-ft-plus working width and 39-ft planing length. The latter is claimed to be the first of a series of heavy planers now in production. Largest will have a 13-ft table width.

Also worthy of note were some advances in such smaller specialized machines as optical jig borers, horizontal and vertical internal broaches, Pittler-type drum turret lathes, leadscrew lathes (including the "thread-whirling" and "fly-cutter" types), multiple-head multi-spindle drills, centerless grinders, and copying lathes.

East-German machine tools have now reached a high level in finish and appearance -- external castings and pressings are carefully surfaced, and machines built by nationalized and privately owned firms alike are coated with a standard light-green paint and have maroon fittings.

Some smaller private manufacturers are emerging from the anonymity of nationalization as a result of the East-German government's "new course." For example, one firm showing at Leipzig was run by the state for three months but was denationalized three weeks before the Fair opened.

Another factor affecting future development of East Germany's machine-tool industry is an agreement between East Germany and Russia under which a number of firms operated by Russia since the war will be returned to the Germans next January 1. It is expected delivery of German machine tools to Russia will diminish.

Some aspects of this are already evident—one of the 800 Dutchmen attending the Fair heads an import-export firm that sells East-German tools to Holland and Indonesia. Some of the tools even pass through Holland to other countries.

The East is still East Germany's dominant sales goal — emphasis on Communist China. Last summer, the Germans staged an industrial equipment display in Peking and Shanghai. The purpose: to familiarize the Chinese with German machines, and to discover China's tool needs.

Chinese Exhibits

At the 1952 show, Chinese machine design was said to be at least 15 years old. This year the estimate is 10 years old. And China showed evidence of modern design: an 140 mm-diameter-capacity internal grinder with grinding spindle running at 16,000 rpm in 3-pt "filmatic" bearings. Largest Chinese machine shown was a 32-ton double-column planer.

Russian Exhibits

In the Russian Hall, the center aisle was lined with machine tools designed for export and thus not necessarily the latest models. Among the score of types shown were: two six-spindle bar automatics, a spiral bevel-gear generator, several internal thread and surface grinders, and a double-column vertical boring mill with a 9-ft, 4-in. table.

Details on Czechoslovakian, Polish, Hungarian and Bulgarian machine tools shown at Leipzig will appear in a later issue.

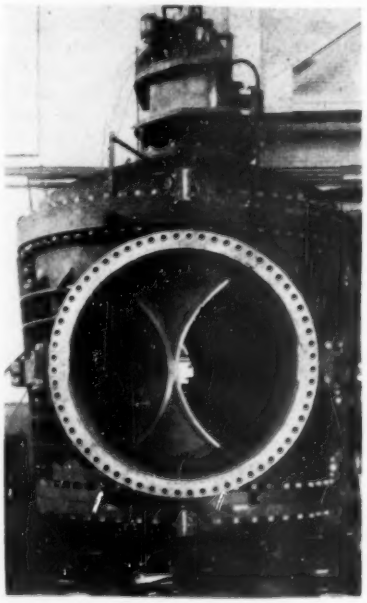
S Morgan Smith Opens $3.5 Million Plant

YORK, PA.—Anticipating at least another decade of rapid expansion of the nation's electric light and power facilities to meeting growing industrial and consumer demand, S Morgan Smith Co this month opened its new $3.5 million electrical machinery plant here.

Some 90% of the new Smith plant will be given over to manufacture of large hydraulic turbines and components for hydro-electric power production (see illustration).

Featured among the many "elephant" machine tools in the 100,000 sq ft plant are three giant Mesta vertical boring mills capable of machining turbine discharge rings and similar pieces up to 40-ft diameter and 13-ft, 3-in. high. These and other machines produce turbines that are used in hydro-electric dams throughout the world.

S Morgan Smith, since its inception in 1876 has produced upwards of 9500 turbines, with a total capacity of 15.4 million hp, and has grown from a small shop to an organization employing 1000 workers. About 15% of its total production is for the export market.



LARGEST ROTOVALVE ever made measures 84-in. across opening, weighs over 200,000 lb, and is one of three being made by S Morgan Smith Co for the government of Afghanistan, where they will control water flow for an irrigation dam

Are Civilian Producers In or Out on Government Machine-Tool Leasing? Wilson Decision Awaited

WASHINGTON—Leasing of "Defense Mobilization Production Equipment Inventory" (DMPEI) machine tools will be restricted to "defense supporting" contractors, according to new NPA regulations.

The Office of the Assistant Defense Secretary for Supply and Logistics has drafted similarly strict leasing rules for the military's idle production equipment.

For Defense Only?

At press time, these regulations were awaiting Defense Secretary Wilson's approval. But there was still serious doubt that leasing of idle Pentagon-controlled tools would be confined to defense contractors. Ordnance tools are already being leased for civilian use.

NPA expects little leasing of DMPEI tools, because leasing has steadily tapered off, is now almost nil. Privately, officials believe few idle military tools will be leased. But they're assuming Wilson will eventually adopt the restrictive leasing regulations.

Later, DMPEI will include idle equipment acquired by General Services Administration through the facilities expansion, pool order and elephant tool programs—total value over $40 million. Machine tool companies participating in the GSA programs have the option to buy machines installed in their plants and are being encouraged to do so.

Only 20% to be Listed

It is estimated that no more than 20% of the government's idle production equipment will be listed in DMPEI (the military owns about 400,000 machine tools, and Defense Dept inventory of idle tools runs about 50,000). It is predicted the services will omit a large number of idle tools from the lists.

The Requirements

These are the NPA criteria for leasing DMPEI tools: equipment will be rented only (1) when unavailable from standard commercial sources, (2) for use on "current production schedules," and (3) for "defense supporting" production.

Where to Apply

Firms wanting DMPEI tools must apply through their respective Commerce Dept industry divisions. Leasing contract will, if approved, then be negotiated with GSA. To identify their production as defense-supporting, companies must explain nature of their operations, plant layout, equipment types and capacity, and "usefulness of production in terms of national defense."

Contractors seeking DMPEI or idle Defense Dept equipment must apply to the Pentagon's Production Equipment Redistribution Group.

DMPEI leases can be cancelled by the government when rented equipment is no longer needed by lessee for required purpose, or when the lessee can get a similar tool from commercial sources. Applicants for DMPEI leases must certify that similar equipment was unavailable from commercial sources within 45 days of date on which lessee would put tool into production.

Officials say there will be "some deviation" from leasing rules: so-called "surplus tools" for production of unneeded or obsolete end-products may be leased, even sold.

Many machine tool executives still fear idle military tools will be made available for non-defense leasing. It's no secret that many Pentagon officials advocate it.

GM to Become Sole M-48 Tank Source: Splits 2½-Ton Truck Contract with Reo

WASHINGTON — General Motors' underbidding of Chrysler by 12% on the Army Ordnance Tank Program came as no surprise to Washington. As early as last spring it became evident that the Army would have to cut back M-48 tank production because inventories were accumulating in US arsenals at a rapid rate. The reason: light attrition in Korea, and superiority of US tanks.

Chrysler has long been agitating for civilian production at its Newark, Del, plant as an East Coast assembly point. Thus the dropping of Chrysler was right in line with Defense Secretary Charles E Wilson's "narrow production base" theory.

GM thus becomes top US tank producer. And it will share 2½-ton Army truck production with Reo. Studebaker had been turning out the truck under separate contract.

Chrysler's Reaction

No, Washington wasn't surprised by these moves, but in Detroit, Chrysler officials, obviously bitter because of their removal from the M-48 tank program, had this to say:

Chrysler President L L Colbert: "All I can say now is that we worked very hard to get this business. Beyond that, the statement from the Secretary of the Army seems to speak for itself."

Chrysler Vice President Robert T Keller: "During the last two years, we at the Chrysler Delaware Tank Plant have been devoting all of our thoughts and energy to the job at hand. We have many months of solid production ahead of us, and we shall continue to devote every effort to it."

The M-48 has been in production at GM's Fisher plant in Grand Blanc, Mich; at Ford's Livonia, Mich, plant; and at Chrysler's Newark plant. Ford is converting to automatic transmission production at Livonia. And Chrysler will phase out next March.

GM to Make T-43's Too?

But here's the rub. Brig Gen Carroll H Dietrick, CO of the Detroit Tank Automotive Center, said some time ago the winner of the medium tank contract would also become sole source of heavy tanks. Chrysler could thus lose its T-43 tank production at Newark.

The 2½-Ton Truck Picture:

Although Army Ordnance officers won't admit it, they're howling mad over a recent Pentagon decision to split 2½-ton Army truck production between GM and Reo. Originally, it was announced that the low bidder would be sole source. And GM, with its ability to underbid most competitors, won again.

Pentagon, it seems, began to worry about possible press reaction, i.e, GM getting too many slices of too many pies. So the contract was split with Reo. Ordnance will now have to stock parts all over the world for two different 2½-ton trucks. Said one Ordnance officer, "the only damned things interchangeable on those vehicles are tires and batteries."

Ray P Powers

Edward K How

Ralph G Holben

David E Stalter

Names in the News

Ray P Powers, has been elected vice president of Packard Motor Co to succeed **George C Reifel,** who has retired. Mr Powers, who will assume charge of all manufacturing operations, comes to Packard from Lincoln-Mercury, where he held the post of general manufacturing manager.

Martin J Wiora has been elected president of Bryant Machinery & Engineering Co, Chicago, succeeding the late **A G Bryant. Charles B Tansley** has been named executive vice president; **Robert A Cole,** vice president; **Daniel F Laffey,** secretary; and **Martin J Wiora, Jr,** treasurer.

Merrick Lewis has been named president of Alliance Machine Co, Alliance, Ohio. He succeeds **H A Fennerty,** elected chairman of the board. Mr Lewis will continue to serve as vice president of the Lewis Engineering & Manufacturing Co.

George L McCaffrey has been promoted to general purchasing agent of Electric Auto-Lite Co, Toledo, Ohio. He has been associated with the company's Syracuse plant for 25 years, serving as purchasing agent for the past nineteen years.

J L Wagoner has joined Multi-Amp Corp, Harrison, NJ, as vice president and national sales manager. Prior to his appointment, Mr Wagoner was associated with Westinghouse Electric Corp for 32 years. He will be responsible for developing and building the sales pattern for the various testing instruments manufactured by the company.

Edward K How has been named manager of sales for General Electric Co's Welding Dept. Mr How joined the company in 1929. He was made sales manager of GE's Locke Dept in 1947, the post he held prior to his new appointment.

Ralph G Holben has been made plant manager of Conoflow Corp, Philadelphia. His former post as production manager will be taken over by **Horace C Shuman,** who has been acting as his assistant. **Harold W Bonekat** is new purchasing agent.

Charles C Reiff engineer of Rockwell Manufacturing Co's Barberton, Ohio, plant, has been promoted to chief engineer of the firm's Delta Power Tool Div, Bellefontaine, Ohio.

H R Greenley has been appointed vice president and general sales manager of Airway Products, Inc, Pontiac, Mich. Prior to his appointment, Mr Greenley was associated in executive sales capacities with Vicker's Inc, and Morse Chain Co, Div, Borg-Warner Corp.

Don W Blend, general manager of the Wolverine Tube Div, Calumet & Hecla, has been elected a vice president of the company. Mr Blend, who will make his headquarters in Detroit, joined the division in 1931.

A W Morgan has been named general manufacturing manager of Convair's San Diego Div. Former works manager of Plant I, Mr Morgan is succeeded by **W L Young,** who has been serving as factory manager.

David E Stalter has been appointed general sales manager of Titan Chain Saws, Seattle, Wash. Formerly senior consultant in the diagnosis and solution of industrial marketing problems for McKinsey & Co, New York, Mr Stalter will headquarter in Seattle and divide his time between the factory and a new office being set up in New York.

Joseph H Pargeter has been named to head steel forge operation of Willys Motors, Toledo, Ohio. Formerly general manager of the company's Aluminum Forge Div, Erie, Pa, Mr Pargeter has been associated with the organization for more than 30 years.

G E Burks has been appointed director of engineering, Caterpillar Tractor Co; he will be responsible for coordination of all engineering groups serving the various plants and divisions of the company. **John E Jass** succeeds Mr Burks as chief engineer of the Peoria plant; **Paul B Benner** and **Carl L Kepner** have been named assistant chief engineers.

Walter G Bain has been appointed to the newly-created position of executive assistant to the president of Republic Aviation Corp. During World War II, and the Korean war, he served with the Air Materiel Command in procurement and production of aircraft. He has also held metallurgical and industrial management posts with Allis-Chalmers Manufacturing Co, and the Ladish Co at Cudahy, Wis.

Judson Neff has been named manager of all manufacturing and production operations in the Pittsburgh and Midland, Pa, plants of Mackintosh-Hemphill Co; in addition, he will serve as manager of the engineering and estimating departments.

Fred A Milnes has been named press specialist for Harrington-Wilson-Brown Co, Mount Vernon, NY. He will supervise and assist in sales and service of mechanical and hydraulic presses manufactured by Clearing Machine Corp. Mr Milnes was formerly connected with E W Bliss Co, and Aluminum Co of America.

William E Johnson has been appointed district representative for Gisholt Machine Co's Cleveland area. He has held various positions in manufacturing, domestic, and foreign sales since joining the company in 1948.

OBITUARIES

Arthur J Mountford Baker, 72, deputy director general of the British Purchasing Commission from 1939 to 1943, died Sept 13 in Brooklyn. Mr Baker, associated for many years with Cincinnati Milling Machine Co, served from 1920 to 1932 as chief engineer in charge of car design with Willys Overland Co. Following his wartime service, he held posts as general manager of Crocker-Wheeler Electric Mfg Co, vice president of E W Bliss, and executive vice president of Melvin Pine & Co. He had recently returned from a two-and-a-half year tour of duty as director of the industry division of ECA.

Bayard D Kunkle, 71, a director and retired vice president of General Motors Corp, died Sept 14 in Detroit. An executive of the company since 1925, Mr Kunkle had retired in 1949 as vice president in charge of Canadian and overseas operations, the household appliance group, and process development at the GE Technical Center.

Adolph Seidel, 65, general sales manager of E W Bliss Co, died Sept 6 in Toledo, Ohio. Mr Seidel had been a member of the organization for 40 years, and had headed sales for the past 20 years.

J Irvin Schultz, 47, vice president and treasurer of National Broach & Machine Co, died Sept 12 in Detroit. Mr Schultz was associated with Ernst & Ernst, Detroit public accounting firm, before joining National Broach in 1933 as controller. He was named assistant secretary-treasurer in 1937, treasurer in 1939, and vice president and treasurer in 1946.

Curtis Whittlesey McGraw

You, and we, lost a sincere friend and valued compatriot with the untimely death on September 10 of Curtis W McGraw, president and chairman of the board of the McGraw-Hill Publishing Company, publisher of *American Machinist*. Mr McGraw had devoted his working life to the supplying of information —authoritative, objective and complete—to our industrial and business society.

Since 1920, when he joined the McGraw-Hill Book Company, his influence has mounted steadily, first in improving the quality of technical and business books, and latterly in raising the standards of the business press. His enlightened leadership and openminded policies have been major factors in improving both the quality of McGraw-Hill publications and operation of the company.

Son of McGraw-Hill Founder

Curtis Whittlesey McGraw, who had headed McGraw-Hill's wide-ranging publishing enterprises for three and a half years at the time of his death in New York, was the third son of the late James H McGraw, Sr, founder of the company.

Soldier

Born in Madisonville, NJ, on October 13, 1895, Mr McGraw attended Lawrenceville School and Princeton University, where he was president of his freshman class. While attending Princeton, he was one of the first to enlist in the Army after World War I broke out. Mr McGraw was among the first troops shipped overseas, saw action in France with the infantry, notably in the Artois sector and Meuse-Argonne offensive, was wounded in the summer of 1918, and was discharged as a major.

Returning to Princeton, Mr McGraw captained the 1919 football team and was active in basketball and other sports. In 1920, he was graduated as a member of the class of 1919 out of consideration for his war service.

With McGraw-Hill 33 Years

That year he began his association with the McGraw-Hill Book Company, a subsidiary of McGraw-Hill Publishing Company. In 1943 he was named vice president and treasurer of the parent company, and in 1950 was elected president and chairman of the board.

His was an administration characterized by concern for every employee and by consideration of the problems of his associates as well as for his customers. He strove continually for improvement and modernization, both of publishing practice and of publishing facilities.

Civic Leader

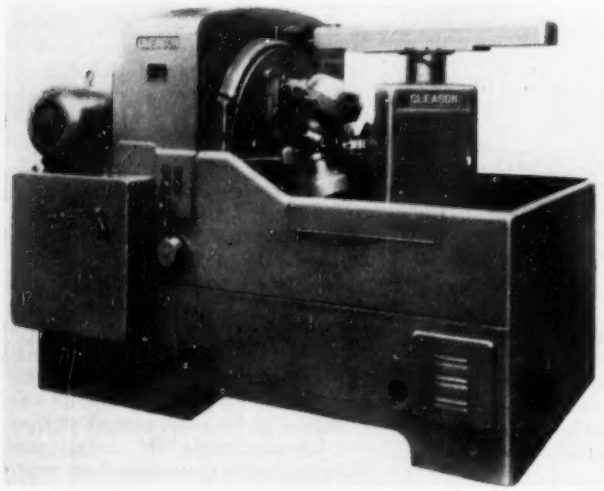
Mr McGraw had recently been appointed by the Postmaster General to the Post Office Advisory Board. He was active in civic affairs of his home town, Princeton, NJ, where he was president of Princeton Hospital, and a director of the First National Bank. He also served as a director of the Princeton University Press.

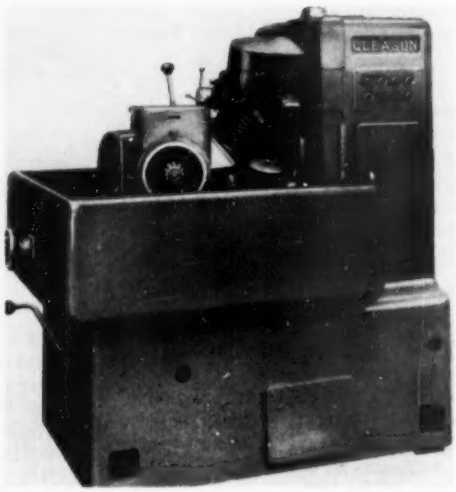
Headed ABPC

Among his other activities, Mr McGraw was past president and director of the American Book Publishers' Council; a director of the Magazine Publishers' Association; and participated in the work of the New York Association for the Blind, the American Museum of Natural History, the National Society for Crippled Children and Adults, the National Association of Manufacturers, the New Jersey Republican Finance Committee, the United States Golf Association, the National Committee of the William the Silent Award for Journalism, and many other organizations.

He is survived by his widow, the former Elizabeth Woodwell; a daughter, Mrs James L Stoltzfus; his mother, Mrs Mildred Whittlesey McGraw; and three brothers, Harold W, James H, Jr, and Donald C McGraw, vice president of McGraw-Hill Publishing Company.

New Shop Equipment





Gleason Automatics for Coniflex Production

The No. 104 straight bevel Coniflex generator (left) and the No. 104 cutter sharpener are new Gleason machines designed for high production of Coniflex gears.

The generator is a completely automatic high-speed machine (3 to 40 sec per tooth) for cutting gears up to 8½-in. dia, 1⅜-in. face width, and 3 DP in one operation from the solid. Gears cut on this machine are interchangeable with those cut on Gleason two-tool generators. While it is recommended that gears be designed according to the Gleason 20° system, any standard pressure angle from 14.5 to 25° can be produced.

GENERATOR DESIGN

The generator uses two multi-blade interlocking, disk-type cutters in place of reciprocating tools. These cutters rotate on axes inclined to the face of the cradle, and cut in the same tooth space. Cutters can be adjusted to proper cone angle and height setting. Cutter speed varies from 80 to 300 fpm.

Index mechanism is intermittent type; rotation of the generating train is controlled by a cam, the design of which permits the roughing and finishing cuts to be combined in a single completing cycle. At start of cycle, work and cradle are stationary with cutters somewhat above center of roll. Before any roll takes place blank is fed in just short of full-depth. Cradle and work then roll down to the bottom of the generating motion, rough-shaping the tooth. Work is next fed to full depth and a fast roll-up finish-generates the tooth slot. At top of roll, work backs out and cradle and work roll down to roughing position. During this short roll-down, blank is indexed. Amount of depth feed is controlled by lever adjustment so a single cam can be used for all depths of work.

As cutters decrease in size due to sharpening, sliding base is advanced to maintain proper tooth depth. Amount of advance is obtained from simple bench fixture on which cutters are compared with a master.

Coniflex gears which this machine cuts are straight bevel gears with localized tooth contact. Cutters produce a slight ease-off toward the end of the teeth to permit gears to operate with assembly tolerances.

The multi-blade cutters are 9 in. in dia. Cutters can be sharpened and trued without removing blades from cutter head. Cutter diameter provides a wide range of lengthwise ease-off; full set of cutters comprises four heads (choice of head determining length of bearing) and fourteen sets of blades varying only in point width. The range of this standard set of cutters is from 16 to 3 DP and from ¼- to 1⅜-in. face.

The Gleason No. 104 Coniflex cutter sharpener was designed to obtain the advantages of good finish, elimination of burning, and increased cutter life while still maintaining a rapid rate of sharpening. Time per blade is 4 sec. Machine will sharpen Coniflex disk-type cutters, 4½ and 9 in. in dia, which makes it a companion machine for the No. 2A and No. 104 Coniflex generators.

SHARPENER DESIGN

Sharpener uses a conical grinding wheel with a wheel stroke to generate the sharpening plane. Small area of contact between grinding wheel and tool sharpening plane eliminates burning, while the wheel stroke produces a fine finish without loss in sharpening time.

Automatic feed of the wheel is provided in timed relation to wheel stroke so a controlled amount of stock is removed at each pass. Cycle is set up to produce twenty passes which remove approximately 0.004 in. from blade surface. If more stock removal is desired, dial adjustment on workhead permits repeat of cycle until desired amount is removed.

The grinding head is adjustable 360° about a horizontal axis. The use of angular settings for the grinding wheel enables right- and left-hand cutters to be ground with only small positioning changes. Range of ma-

Materials and Parts

chine adjustments is comprehensive enough to allow sharpening, not only of standard cutters, but also of blades with high hook and side rake angles.

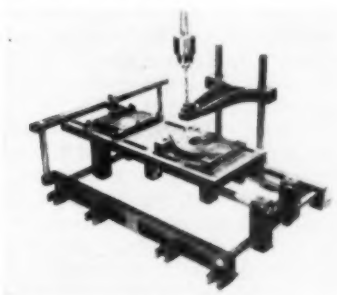
Machine is semi-automatic in operation, stroke and feed being automatic after operator has pushed starter button. After twenty strokes, wheel swings away from cutter blade to obtain clearance for indexing. In this position wheel can be periodically dressed.

Index is hand-operated, of notched-plate type. Indexing for the different numbers of blades is provided by supplying a small number of precision index plates, together with auxiliary plates for each required number of blades.

The dresser is hydraulically controlled, engages the wheel in the swung-out position, and is provided with adjustable rate control which can be preset for rough or finish dress. Desired rate can be selected by shifting a valve.

Additional new Gleason machines include a No. 106 hypoid generator, No. 104 angular hypoid tester, and No. 104 spur gear tester; these machines will be described in forthcoming issues.

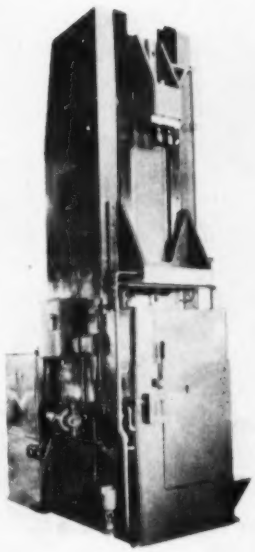
Gleason Works, 1000 University Ave, Rochester 3, NY



Hole-Locating Device For Accurate Production Drilling

Device is reported to make any drillpress produce accuracy commensurate with jig drilling and reaming, and jig boring. Work up to 6¾-x10 in. can be handled; work height is limited only by drillpress. Unit has alloy cast iron base and table, heat-treated ground shafting, and tool steel drill bushings.

Honnef Engineering Co, Wethersfield, Conn



Acme Vertical Internal Broaching Machine Line

Line of Acme vertical internal pull-up hydraulic broaching machines covers range in sizes from 6-ton capacity, 36-in. stroke to 30-ton capacity, 60-in. stroke. Machine illustrated is the V-20-60 with 20-ton capacity (max 24 tons) and 60-in. stroke for handling broaches to 66 in. long.

Although machine is shown tooled to handle two broaches at a time, larger parts may be broached using a single broach or four or more smaller parts may be broached simultaneously. Operator drops parts over top shank end of broaches. Actuating control lever raises broaches up through work bushings in stationary work table and into broach pullers. When control lever for main cylinder is thrown, broaches are drawn upward through cutting stroke and parts then drop on angular table which allows cutting oil to drain. Broaches are then returned downward into lower elevator bushings and lower elevator run down into loading position.

Machines feature adjustable cutting speed and convenient stroke adjustment. As safety feature, as well as to provide "feel," two-control-lever arrangement requires both hands.

Acme Broach Corp, Milan, Mich

... INCLUDING

Milling and routing machine provides fingertip operation through hydraulic tracer servo control page 176

Plastic injection-molding machine plasticizes 125 lb of material per hr, develops 450-ton locking pressure page 176

Automatic horizontal milling machine is electric-tracer-controlled page 177

Full-swivel milling attachment, with range from 800 to 2400 rpm, is independently driven page 177

Gear tester checks all types of fine-pitch gears and provides visual indication with 0.0001-in. sensitivity page 178

Bevel-gear testing machine records tooth alignment, thickness, profile, and surface finish page 184

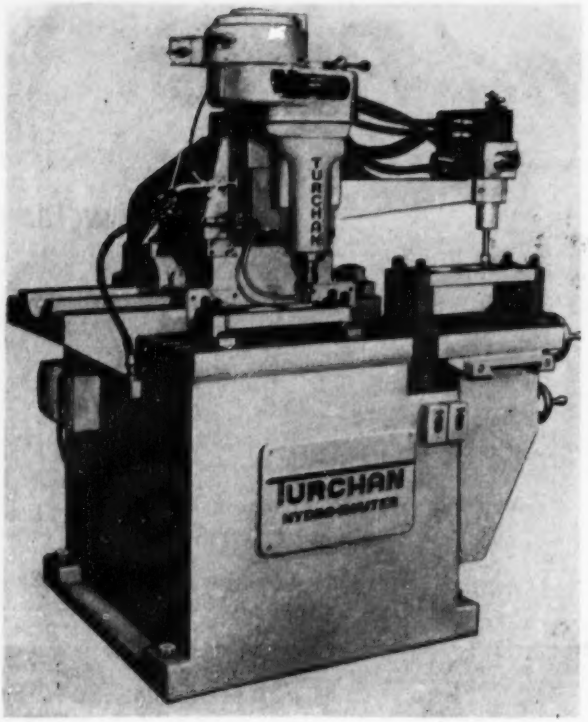
Plastics replace aluminum in core dryers used for casting both ferrous and non-ferrous metals page 190

Guillotine punch designed for production, provides 75-ton thrust and 3-second cycle page 194

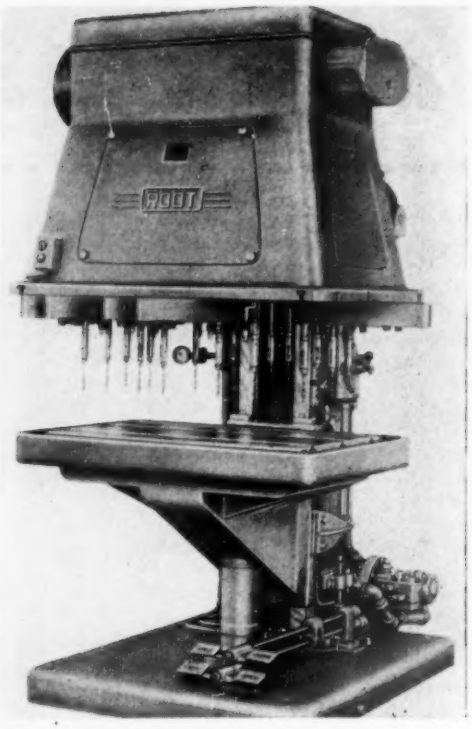
... and in Oct 12

National Metal Exposition Show-in-Print describing new materials and equipment to be shown in Cleveland the following week.

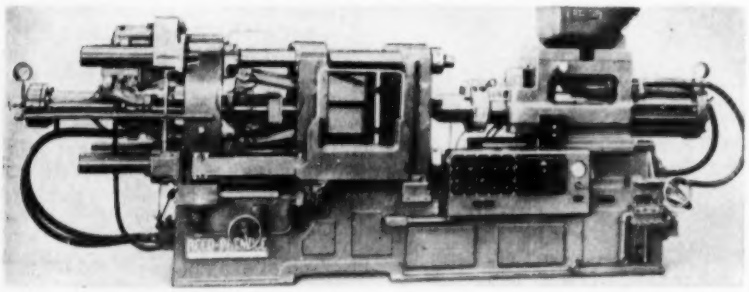
Automatic positioner for precision jigboring operations incorporates photoelectric centering devices.



MILLING AND ROUTING MACHINE, tracer-controlled, provides for fingertip operation through hydraulic tracer servo control. Hydraulic feeds are of infinitely variable rates with stepless tracer control. Feed rates: 0-65 ipm; spindle speeds: 900 to 3600 rpm. Micrometer dials read in 0.001-in. graduations. Equipment includes 3-dimensional tracer control — *Turchan Follower Machine Co, 8259 Livernois, Detroit 4, Mich*



MULTIPLE DRILLER, F400, is a rectangular hood-type machine with universally adjustable spindles. A 10-hp motor drives spindles through variable speed mechanism. Hydraulic table feed is employed. Rapid table traverse allows rapid advance to point of drilling, normal drilling, and return. Feed rate is stepless — *B M Root Co, York, Pa*



Plastic Injection-Molding Machine Develops 450-ton Locking Pressure

Reed-Prentice 450T-20 and -24 plastic injection-molding machines feature rugged tie-bar construction, central controls, high plasticizing capacity, and new feed hopper.

Four 5-in.-dia tie-bars form a frame for the mold-locking mechanism and the die platens, which measure 45x40 in. (hor by vert). Rated casting area in mold is 200 sq in.

Both the 20- and 24-oz machines develop 450 tons positive mold locking pressure and provide 16-in. stroke independent of mold thickness. Die stroke is adjustable through a mechanism in the toggle cylinder.

Central operating panel controls movement of die-plate and plunger. This panel also houses three electrical timers for semi-automatic or fully automatic operation, and a fourth timer governs the length of time that full delivery from both hydraulic pumps is on plunger in order to give rapid injection.

Heating cylinder on the machines plasticizes up to 125 lb of material per hour. Heater is mounted on vertical ways to permit easy removal from injection housing.

Grouping of motor, piping, and hydraulic equipment mounted at rear of machine facilitates maintenance. Steps and platform at rear protect 40-hp main motor and provide access to the feed hopper. New hopper affords operating convenience by accommodating a standard 200-lb material drum on a 45° angle.

Reed-Prentice Corp, Worcester 4, Mass

Beryllium copper alloys, such as No. 10, 25, and 165, are available in strip up to 8 in. wide, and down to 0.0005 in. thin, to tolerances as close as ±0.0001 in., solution-annealed or rolled to temper. Strip is supplied in any quantity from one to thousands of pounds.

Industrial Div, American Silver Co, 36-07 Prince St, Flushing 54, NY

Cheaper and Easier Nickel-Plating

Hanson-Van Winkle-Munning process, Nickel-Lume, reportedly produces better and brighter nickel coatings, is cheaper to operate, and is easier to control than other bright-nickel processes.

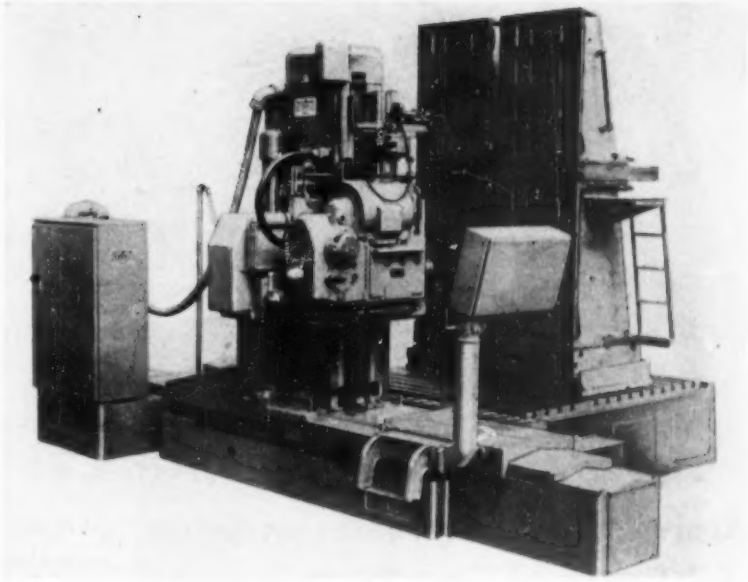
Equipment suitable for a Watts nickel bath is all that is required. Ordinary auxiliary equipment may be used, filtration may be either periodic or continuous, ventilation is not required, and heat demands are said to be as much as 25% lower.

Advantages claimed are: a bright white color, well-leveled surfaces, low internal stress, good ductility, and highly active surfaces.

Nickel-Lume baths may be operated from room temperatures up to 140 F with full deposit brightness. Current densities may be varied from 5 to 70 asf. Because of the wide range, uniformly bright deposits may be plated on intricately shaped articles and plating speed may be changed to meet various specifications.

It is claimed that Nickel-Lume overcomes many limitations of present processes because: no batch purification treatment is needed under good average operating conditions; thin deposits are bright; surface preparation is held to a minimum; reject-stripping costs are low; baths have high tolerance to impurities; process is easy to control, uses regular non-premium nickel anodes.

Hanson-Van Winkle-Munning Co, Matawan, NJ



Electric-Tracer-Controlled Miller Is Automatic Horizontal Machine

Keller BG-21, patterned after the BG-22, but smaller in size and capacity, has horizontal construction to provide maximum support for spindle head. Movable weight is always constant because workholding table is stationary while spindle head carries cutter along work. Both spindle and tracer are adjustable; it is not necessary to locate work and model in exact relation to each other.

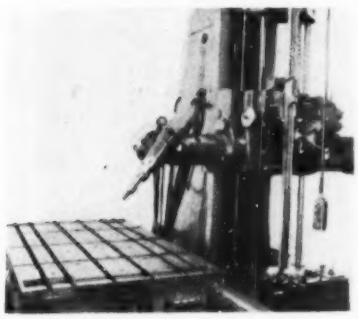
Tracing is possible by two methods: (1) Following a sheet-metal templet or side walls of a model with profiling tracer and cutting the duplicate shape with the side of an end mill; (2) Using a three-dimensional tracer to follow a full model in a series of parallel passes with spacing preset by operator.

Lubrication is simplified by central oiling system. All sliding surfaces have phenolic to metal contacts. All leadscrews run through molded phenolic nuts.

Speed control automatically regulates the relative component travel speeds over irregular shapes to produce a constant surface cutting speed. Keller machines are equipped with a power-limiting relay that protects against tool breakage.

BG-21 can be obtained in five models, ranging from 4x2½ ft to 10x4 ft, plus special two-spindle models. Rapid traverse up to 250 ipm and automatic chip conveyors are standard on larger models.

Pratt & Whitney, Division Niles-Bement-Pond Co, West Hartford 1, Conn



Full-Swivel Milling Attachment Is Independently Driven

Giddings & Lewis announces a new-type high-speed milling attachment designed to machine aluminum alloy forgings for airplane wing hinge sections. Unit was built for Grumman Aircraft to be used on a G & L table-type horizontal boring, milling, and drilling machine.

Independently driven, attachment has no connection with machine spindle and therefore does not depend on any high-inertia driving elements in machine headstock. Headstock acts only as carrier for moving attachment up and down.

Designed for 360° of vertical and horizontal swivel, attachment has a retractable spindle providing easy cutter retraction and relocation on tough machining assignments. Collets at outer end grip spindle tightly to prevent vibration and chatter.

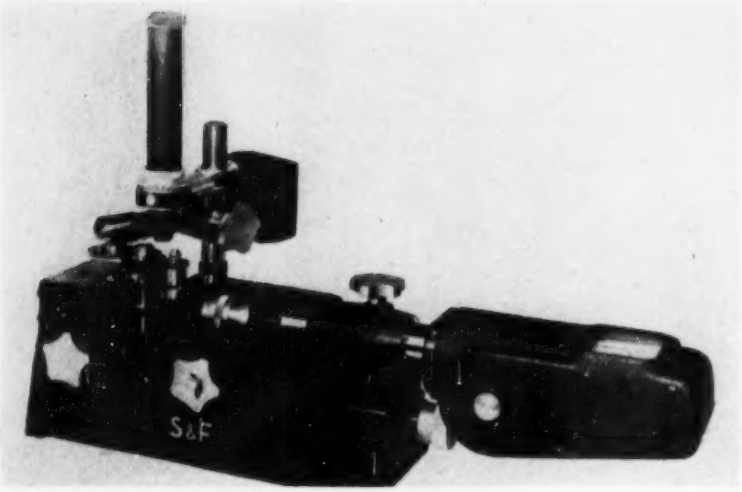
Special design provides for quick mounting or removal of unit. Speed control is obtained from a throttle lever on top of a variable volume pump, and safety overload protection to the cutter and feed motor is incorporated in the design.

Device has a speed ratio of 3:1 and a spindle-speed range from 800 to 2400 rpm for high-speed machining of non-ferrous metals.

Giddings & Lewis Machine Tool Co, Fond Du Lac, Wis

Crane scale, guaranteed to be accurate to with 0.2 of 1% of capacity, is available in 1000, 2000, 5000, and 10,000-lb ranges. Large top U-bolt and 360° swivel hook allow scale to be used on any crane or hoist for any job. The 21½-in.-dia dial is tilted downward 15° for easy reading.

A H Emery Co, New Canaan, Conn



Universal Gear Tester Inspects All Types of Fine-Pitch Gears

S&F gear tester can be used for inspection of spur, bevel, and helical gears; worms and worm gears; flat and round racks; pinion-shafts; finished and semi-finished gear assemblies; and extremely small gears and pinions used in instruments.

Principle of operation involves the rotation of test gear in contact with master gear. In order to mesh the gears without backlash, both flanks of test gear are in contact with master.

The basic instrument provides for visual indication, on a dial with sensitivity of 0.0001 in., of all errors affecting the actual performance under operating conditions. These errors are indicated as total composite error (made up of runout and including lateral runout or wobble) and tooth-to-tooth composite error (combined effect of circular pitch error, tooth-thickness variation, and profile error).

Addition of a Graphotest mechanical recording instrument will provide a permanent graphic recording of errors and simplify the total composite error into its components of runout and tooth-to-tooth composite error. Magnifications of 100, 200, 250, or 400 are available in the Graphotest.

The S&F tester was designed to provide both the sensitivity needed for laboratory work and the ease of use required for production testing. The smallest gear center distances can be obtained without additional clamping fixtures or angle blocks. Simple arbors with cylindrical shafts are used for holding the gears; no tapered shafts are required. Height of gears is adjusted by means of V-blocks and clamping knobs.

Tester can be supplied equipped for either hand- or motor-driven rotation of gears. For high-production testing, a semi-automatic model can be furnished; only manual operation is changing of test gears.

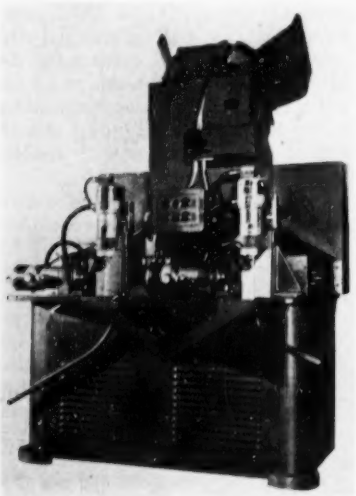
Instrument consists of bed, slide (which carries test gear), and measuring-slide carrier for the measuring slide and master gear. Bed slide and measuring slide carrier are mounted on common base. Interchangeable bed slides adapt tester to inspection of various types of gears.

Measuring slide travels on ball bearings with pressure maintained by flat spring. Travel is ⅛ in. with control by knob and threaded spindle of center-distance setting. Overload clutch prevents damage. Spring loading is adjustable with pressure ranging from 0 to 8 oz. in either direction. Provision is made on measuring slide for mounting of indicator dial or attachment of Graphotest recorder.

Gears are illuminated from below through a green-glass window on top of workbench. If desired, 30-power microscope can be mounted on top.

Replacement parts are carried in stock at Orban service centers in Cleveland, Detroit, and Newark, where complete servicing facilities are also available.

Imported by Kurt Orban Co, Inc, 205 E 42nd St, New York 17, NY



Automatic Drilling, Burring Machine Has Double Feed

Automatic drilling and burring machine with double feed has been designed for second operations on screw machine parts up to 1-in. dia and 2 in. long, drilling holes at any angle desired.

Double feed facilitates larger production at slower operating speeds, and permits half of machine to be serviced while balance is in operation. Production capacity is 3000 pieces per hour.

Inter-Lakes Engineering Co, 4845 Bellevue, Detroit 7, Mich

CARBIDE TOOL FINISHING MACHINE, Model 454, was designed for final finishing with abrasive belt after rough grinding with silicon carbide wheel. Machine features tungsten carbide faced platen permitting the finishing of end, top, and side clearance angles. Model 454 can also be used for sharpening HSS tools and miscellaneous grinding and sharpening operations. ***—Hammond Machinery Builders, 1600 Douglas Ave, Kalamazoo, Mich***

FEDERAL has *Everything* in Gages

for Dimensional Control

"AUTOMATION"
The Newest Aid To Mass Production

AUTOMATIC SORTING GAGES

FEDERAL'S AUTOMATIC SORTING GAGES keep pace with modern mass production. The possibilities in multiplicity of dimensions, accuracy and speed are worth your investigation. Write for illustrated book.

AUTOMATIC GAGE sorts diameters into 21 categories.

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INSIDE DIAMETER GAGES

Wide diversity of types for various requirements from ⅛″ diam. up.

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SNAP GAGES — to fit particular needs and all dimensions from 0″ up.

COMPARATORS

Electronic super-precise and Dial Indicator types to suit your particular need.

THICKNESS GAGES

Bench and Portable to suit special industrial specifications.

DEPTH GAGES

Faster and more accurate than old style flush pin gages.

THREAD GAGES

Thread Lead accuracy is as important as Pitch Diameter.

GAGE ENGINEERING

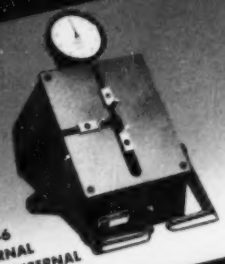
Over 30,000 special designs. We can modify stock gages to suit, or completely design and build gages to fit your need.

Printed in U.S.A.

Federal offers you: one source for all of your snap gages for inspecting all dimensions.

200P-1
INDICATING MICROMETER

INSIDE DIAMETER GAGES



368-6
INTERNAL AND EXTERNAL COMPARATOR

1203 SERIES
HOLE GAGES

1201P SERIES
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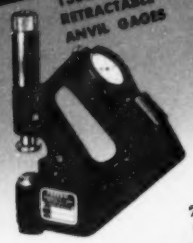
1243 AND 1242 SERIES
LONG RANGE HOLE GAGES

OUTSIDE DIAMETER GAGES

1000 SERIES
ADJUSTABLE SNAP GAGES

1340
SINGLE PURPOSE GAGE



1330P-100 SERIES
RETRACTABLE ANVIL GAGES

264
HEAVY DUTY GAGE

236 SERIES
SHALLOW DIAMETER GAGES

THICKNESS GAGES

368-6 COMPARATOR OR THICKNESS GAGE

4918
THICKNESS GAGE

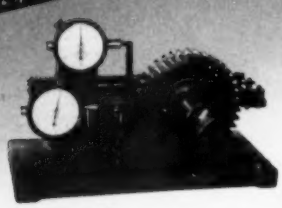
578-
1, 2, AND 3
LONG RANGE
THICKNESS GAGES

22P
LONG RANGE
THICKNESS GAGE

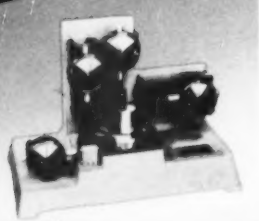
26P
THICKNESS GAGE

GAGE

KB222
THICKNESS GAGE



2028-130
PITCH DIAMETER AND CONCENTRICITY GAGE



2368-253
HEIGHT AND DIAMETER GAGE

Everything in Gages for Dimensional Control

FEDERAL PRODUCTS CORPORATION

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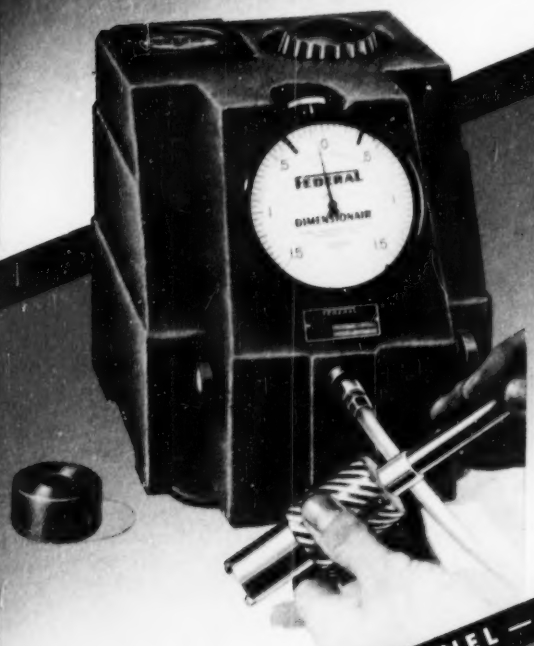
FEDERAL has *Everything* in Gages

for Dimensional Control

Air Gages, Picture Panel, Continuous Measuring and Size Control Gages enable Federal to meet every dimensional control requirement.

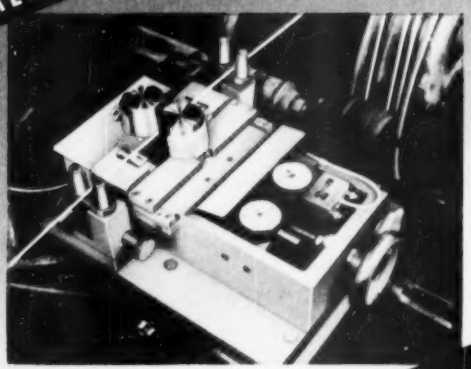
DIMENSIONAIR — AIR GAGE



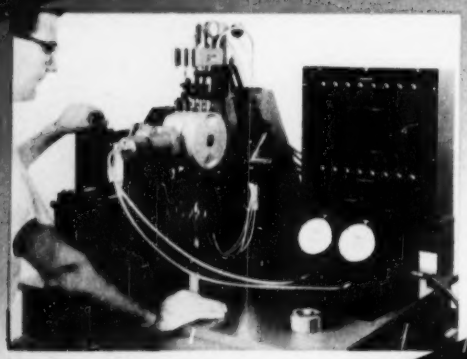
THE DIMENSIONAIR is really an outstanding gage. Its greater range, calibrated scale, stability, ease of setting, low maintenance, and the economy of its single master are well worth your investigation. Write for catalog.

At right: Two large diameter, *six*-jet plugs inspect thin rings for diameter at six points. Automatic guide sleeves on plugs make rings slip on easily.

PICTURE PANEL — CONTINUOUS MEASURING

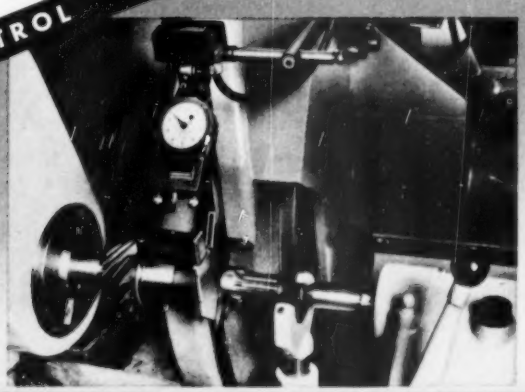


Right: Federal Continuous Gages not only measure the thickness of round or flat material but they control it by adjusting the machine to compensate for variations out of tolerance.



Left: Multiple dimensions are inspected simultaneously and quickly with Federal Picture Panel Gages. This one gages 10 dimensions in two operations. Both the Federal Dimensionair and Federal Electricators are used.

SIZE CONTROL



Automatic Machine Control for machining workpieces to size is a new Federal development that ties into modern trends. The gage automatically adjusts the machine so that all parts are produced in tolerance.

LOOK INSIDE FOR DIAL INDICATOR GAGES

FEDERAL PRODUCTS CORPORATION

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FYI
FOR YOUR INFORMATION

***FREE** Catalogs, Booklets, Charts, Calculators*

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 MILLING MACHINES—*Misel Machinery, New York 23, NY.* 8-page illustrated catalog contains detailed descriptions of line of Cervinia units, and specifications of nine models.

2 DOUBLE-SPINDLE GRINDERS—*Gardner Machine Co, Beloit, Wis.* 28-page catalog pictures and describes line of precision machines for parallel surfacing operations. Contains data on 16 work-carrying fixtures adaptable to units.

3 HYDRAULIC PRESSES — *Clifton Hydraulic Press Co, Clifton, NJ.* 36-page bulletin 10 illustrates extensive line. Specification data and applications included.

4 VERSA-MIL—*Versa-Mil Co, New York 36, NY.* 26-page catalog describes basic unit which mills, drills, bores, reams, and faces. Combined with machine tools, it makes special-purpose tool. Range of accessories illustrated for providing variety of machine tool functions. Applications described.

5 DISK GRINDERS — *Mattison Machine Works, Rockford, Ill.* 11-page bulletin 647-2RM contains information on 6-unit line of Hanchett-type double spindle production units. Includes features, specifications and applications.

6 WHEEL LATHE—*Consolidated Machine Tool Corp, Rochester 10, NY.* 23-page bulletin 3101 illustrates Sellers tracer control unit. Basic structure, advantages, and features presented.

7 SHEET METAL FABRICATOR — *Wales-Strippit Corp, N Tonawanda, NY.* 8-page illustrated catalog 10-AA describes unit with improved Hydra-New-Matic drive for punching, notching, and nibbling up to 165 strokes per minute.

8 CYLINDRICAL GRINDERS—*Landis Tool Co, Waynesboro, Pa.* 18-page booklet describes standard precision grinder, job-engineered if tooling is necessary, to fit specific requirements. Cost-saving applications and examples illustrated.

9 COMBINATION PLANING & MILLING MACHINE — *Waldrich GmbH, Siegen, Germany.* 34-page catalog contains illustrated data on unit which cuts any material by both operations. Features, operation and maintenance covered.

TOOLS AND ACCESSORIES

10 PORTABLE ELECTRIC POWER TOOLS—*Thor Power Tool Co, Aurora, Ill.* 40-page catalog illustrates and describes complete line of industrial and automotive tools. Accessories, attachments, specifications, prices included.

11 SHEAR KNIFE HANDBOOK — *American Shear Knife Co, Homestead, Pa.* 72-page booklet covers selection for various applications, care, and operations, tolerances, and suggestions on grinding of used knives. Includes tables and specifications.

12 MILLING CUTTERS — *Goddard & Goddard Co, Detroit 23, Mich.* 51-page catalog No. 3 on standard hi-speed steel cutters. Specifications and price list included.

13 JIG & FIXTURE DETAILS—*Hanco Engineering, Detroit 23, Mich.* 28-page catalog with full scale dimensional drawings covers 28 most commonly used; includes wide range of sizes comprising 240 details and 175 sizes of alloy steel studs.

14 MEASURING INSTRUMENTS — *Brush Electronics Co, Cleveland 14, Ohio.* 34-page booklet illustrates and describes 37 instruments for electrical, physical, resistance-welding, electro-acoustical measurements, etc.

15 METAL CUTTING—*Clemson Bros, Middletown, NY.* 28-page pocket-size booklet illustrates detailed information on selection and use of blades, and frames, and cutting speeds for metals, plastics, and non-metallics. Includes prices and specifications.

16 POWER TOOLS — *Boice-Crane Co, Toledo 8, Ohio.* 52-page illustrated catalog 53 carries complete descriptions of tools for cutting, shaping, drilling, and finishing metal, wood, fiber, plastics.

17 DIE SETS—*Superior Steel Products Corp, Milwaukee, Wis.* 24-page catalog 80 illustrates features to simplify han-

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FYI
FOR YOUR INFORMATION

dling from bench to press. Ordering information and specifications provided.

HEAT-TREATING AND WELDING

18 SOLDERING FLUXES — *Kester Solder Co, Chicago 39, Ill.* 12-page catalog contains detailed information on wide variety of formulas for production use and experimental purposes.

19 ARCWELDING MACHINES — *Air Reduction Sales Co, New York 17, NY.* 44-page illustrated catalog describes 20 models, ac, dc, and inert-gas. Features, specifications, electrical data, and accessories included.

20 WELDING NICKEL ALLOY STEELS—*International Nickel Co, New York 5, NY.* 44-page bulletin A-93 offers study of various techniques, including inert gas processes, electrodes, pre- and post-heat treatments. Typical results given for low alloy high strength steels, low carbon and medium carbon engineering alloy, and special steels.

PLANT SERVICE EQUIPMENT

21 HYDRAULICS FOR INDUSTRIAL MACHINERY—*Vickers Inc, Detroit 32, Mich.* 15-page bulletin 1300-S covers recommendations for hydraulic oil selection and basic system maintenance; reviews characteristics under normal and extreme conditions. Table of common difficulties and corrective action included.

22 PLANT LAYOUT — *South Bend Lathe Works, South Bend, 22, Ind.* Scale models of machine tools offered on free loan basis in kit containing several models of 9 different units, and floor plan sheets.

23 HIGH VACUUM PUMPS — *F J Stokes Machine Co, Philadelphia 20, Pa.* 36-page catalog 750 covers Microvac line. Includes tables of formulas, constants, and conversions used in vacuum processing, pump selection, and data on maintenance procedures.

24 FILTERS—*Industrial Filtration Co, Lebanon, Ind.* 8-page bulletin presents dimensions and capacities of Delpark filters. Applications and features illustrated.

25 NOISE CONTROL — *Sigma Engineering Co, Los Angeles 33, Calif.* Flip-booklet illustrates the Lee Sonic Ear-Valv, which cuts out noise only, allows air circulation, pressure changes, and sound intelligence.

26 INDUSTRIAL LIGHTING EQUIPMENT — *RLM Standards Institute, Chicago 6, Ill.* Revised edition of standards specification book includes three new specifications, new lighting data curves, and tables.

27 BELT CONVEYOR IDLERS—*Link Belt Co, Chicago 1, Ill.* 48-page book 2416 describes 500 idlers in 34 types. Schematic drawings and dimensional data included.

28 BLOWERS — *Billmyre Blower Div, Lamson Corp, Syracuse 1, NY.* 32-page bulletin B-6 covers performance data on centrifugal blowers and exhausters for air or gas handling. Applications illustrated, and technical information included.

29 SMALL PUMPS—*Tuthill Pump Co, Chicago 19, Ill.* 12-page catalog 101 covers line of Model L series for lubricating, hydraulic, transfer, circulating and burning oils service. 12-page catalog 102 presents Model C series for non-corrosive liquids with lubricating qualities.

30 MATERIALS HANDLING—*Heppenstall Co, Pittsburgh, Pa.* 24-page illustrated brochure describes tongs and C-hooks for lifting products. Suction, automatic, and motorized tongs covered; and hooks for single or double lifting.

PARTS AND MATERIALS

31 BEARING BRONZE — *Johnson Bronze Co, New Castle, Pa.* 104-page catalog 530 covers bearings, bars, babbitts, powder metallurgy. Technical data, size, and numerical listings presented.

32 LOW-ALLOY STEEL — *Jones & Laughlin Steel Corp, Pittsburgh 30, Pa.* 26-page booklet on Jalten high-tensile steel describes properties, uses, applications, cold-forming recommendations.

33 FORGINGS—*Mueller Brass Co, Port Huron, Mich.* 32-page illustrated catalog contains full information on brass, bronze, and aluminum alloy forgings. Composition and physical properties in chart form; detailed instructions and engineering drawings for machining various alloys.

34 TUBE & PIPE FITTINGS—*Flodar Corp, Cleveland 3, Ohio.* 28-page catalog 553 covers complete high-pressure line. Engineering tables, specifications, selection data and instructions presented.

35 GAGING CARTRIDGES — *Sheffield Corp, Dayton 1, Ohio.* 24-page booklet illustrates and describes variety of applications of Plunjet cartridges for use in conjunction with column and dial type Precisionaire gages and other makes.

36 TOOL STEELS—*Bethlehem Steel Co, Bethlehem, Pa.* 28-page booklet gives principal characteristics for six oil- and air-hardening grades. Applications and correct methods of heat treatment outlined.

37 METAL HOSE—*Titeflex, Inc, Newark 5, NJ.* 48-page catalog 200 offers illustrated information on Titeflex and Uniflex hose. Specifications, typical assemblies, applications included, as well as engineering data and ordering information.

38 SILICONES — *Dow Corning Corp, Midland, Mich.* 24-page booklet of general information and variety of applications.

39 CONE-DRIVE GEARS — *Cone-Drive Gears Div, Michigan Tool Co, Detroit 12, Mich.* 36-page bulletin CD-173 illustrates variety of applications for double-enveloping worm gearing in wide range of sizes.

40 PNEUMATIC CONTROL ACCESSORIES — *Minneapolis - Honeywell Regulator Co, Philadelphia 44, Pa.* 16-page illustrated catalog 8950 describes wide variety, including air pressure regulators, filters, relays, switches, valve positioners. Data on control piping systems and computing of air capacities included.

41 MINIATURE BALL BEARINGS—*Miniature Precision Bearings, Inc, Keene, NH.* 20-page catalog offers comprehensive design and application data on radial, angular contact, pivot, and thrust bearings in sizes from 0.100 to 0.375 in. OD. Includes technical data, graphs, tables, dimension charts, load rating, speeds, tolerances, clearances, and lubrication.

42 RIVETS — *Townsend Co, New Brighton, Pa.* 12-page catalog TL-76 contains detailed description of complete line of Cherry blind rivets. Applications, specifications listed, and data on guns for application.

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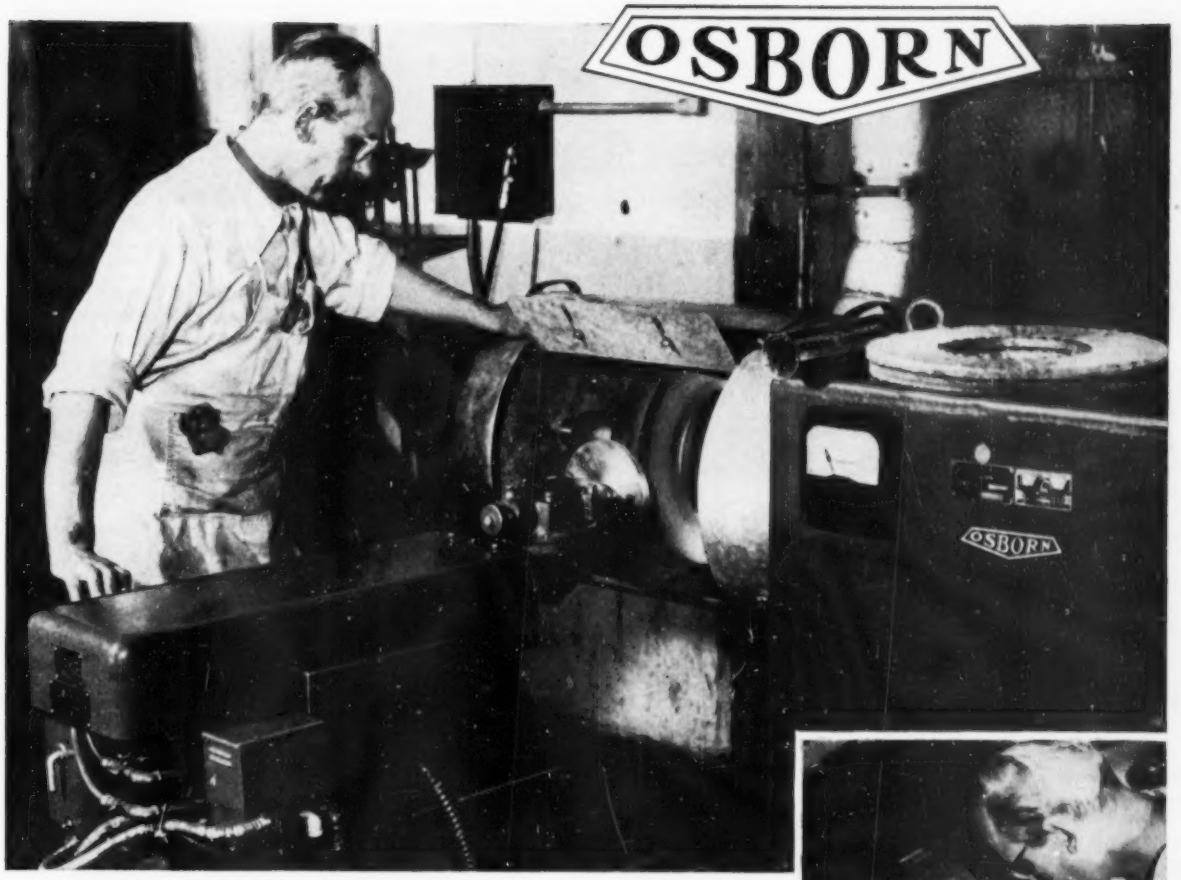


Cuts burr removal time 50% ...greatly improves quality

Power Brushing of transmission gears removes burrs and blends surface junctures automatically. It has paid off 5 ways for a large East Coast manufacturer of aircraft parts.

Their Osborn Brushing Machine produces a uniform required rounding of .030" to .090". It accommodates gears and splines of most types, internal and external. It is easy to adjust for small gear lots and production runs of from 15 to 5,000 pieces. It eliminates costly scrap. *And* less effective hand method time was cut almost 50%.

Production bottlenecks and ineffective finishing departments in *your* plant can be reduced, often eliminated, with Osborn Power Brushing methods.

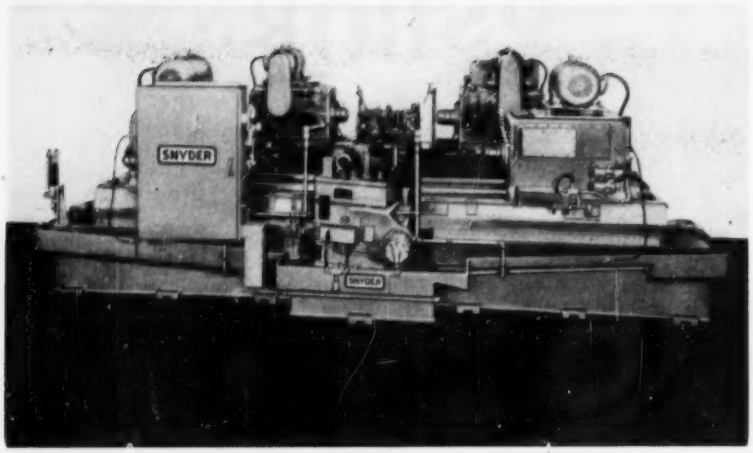
Find out how you can cut *your* costs . . . improve your workmanship. For new bulletin, Automatic Deburring, call in your nearby **O**sborn **B**rushing **A**nalyst for complete information, or write *The Osborn Manufacturing Company, Dept. C-10, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

SEE THIS BRUSHING METHOD DEMONSTRATED AT METAL SHOW — BOOTH 1030

Operator can set up in a few minutes. Work is power rotated against the face of the brushes. A pre-set timer controls length of the cycle and retracts the holder.

Old method of hand burr removal was inaccurate, costly and time-wasting.



Automatic Double-End Machine Processes Landing Gear Cylinders

Machine was developed by Snyder Tool & Engrg Co and processing sequence is rough machining, heat treating, and finish machining. Two double-end machine sections are placed side by side. Part is manually loaded and clamped in fixture and fixture is loaded into one machine section and power-clamped in position.

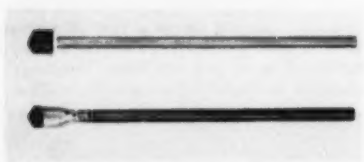
With part in working position, operator selects proper tools and uses them in required sequence, alternating from one end to other so tools can be changed while work is going on. Two trunnion ends are hollow-milled and centered, and two cylinder ends are bored, faced, and centered. Carbide and high speed tools are used for this operation.

Each unit is controlled separately and work cycle is automatic. When start button is pressed, motors start and head begins rapid traverse until feed switch is contacted, causing unit to feed to depth and automatically return.

Heads are provided with eight spindle speeds, selected by moving two levers, varying from 43 to 416 rpm. Shift mechanism is interlocked so gearing cannot be damaged by incorrect positioning of shift levers.

Units have max 30-in. stroke and are capable of feed rates from ½ to 30 ipm. Floor space is 185x240 in.

Snyder Tool & Engineering Co, 3400 E Lafayette, Detroit 7, Mich



Fluteless Carbide-Tipped Drill

Fluteless, carbide-tipped drill, designed for drilling plastics and shallow holes in cast iron, is available, according to the manufacturer, for 1/10th the price of a conventionally tipped high speed steel drill.

Tool consists of a shank of drill rod between 50 and 60 percent of the diameter of the tip, joined together by brazing. Due to the strength of the alloy employed, steel pockets or guides for the tip are said to be unnecessary, leaving ample room for chips.

Drill is tested at the factory by drilling into cast iron with a feed of 0.003 in./rev. Braze material built up around the tip provides strength and rigid support. Elimination of flutes increases rate of penetration into plastics and non-metallics.

Unit is manufactured in sizes from 13/64 in. to 11/16 in.

Hayden Twist Drill Co, 8626 Lyndon Ave, Detroit 21, Mich

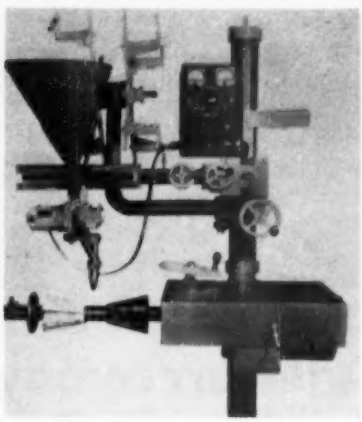
OFF-CENTER THREADING TOOL provides for 60° threading of work closer to shoulder than with conventional tools. Designated ETS, tool is available in seven sizes from 3/16- to ¾-in. shank — *Super Tool Co, 21650 Hoover Rd, Detroit 13, Mich*

Non-Hygroscopic Flux Solves Aluminum Joining Corrosion

Eutectic Welding Corp reports that the great majority of corrosion problems normally found in aluminum joining, as a result of the corrosive properties of the slag of conventional fluxes, can now be minimized or entirely eliminated with Eutector flux 190NC.

This activating flux lowers surface tension and provides improved wettability, the manufacturer claims. It cleans the joint area by removing all oxides, acts as an automatic heat indicator (melting of the flux indicates the approximate joining heat), and promotes consistently smoother and faster flow of alloy, thus requiring less material per joint.

Eutectic Welding Alloys Corp, 172nd St & Northern Blvd, Flushing 58, NY



Automatic Rebuilder Handles Varied Sizes, Shapes of Work

Mir-O-Col K-2 automatic machine for rebuilding wheels, pulleys, track rollers, idlers, and cones, is designed to handle work of any size up to 40 in. in diameter. Model, which takes all types and sizes of wire up to ¼ in., welds 30 in. of bead per minute.

Unit is equipped with adjusting wheel permitting vertical adjustments of 1/64 in.; lock on centers prevents slippage, and insures concentric build-up; gear reducer on motor permits variable spindle speeds from ¼ to 3 rpm; automatic welding positioner, and simplified control panel. Welding power of the lightweight, portable machine is 500 amp, 60%-duty ac transformer.

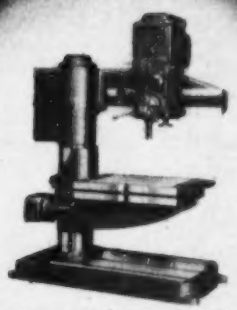
Model can be supplied with twin head to handle two jobs of different diameters simultaneously. Separate rack and pinion assemblies enable rebuilding of a 40-in. idler and a 24-in. roller at the same time.

Mir-O-Col Alloy Co, 312 North Ave 21, Los Angeles 31, Calif

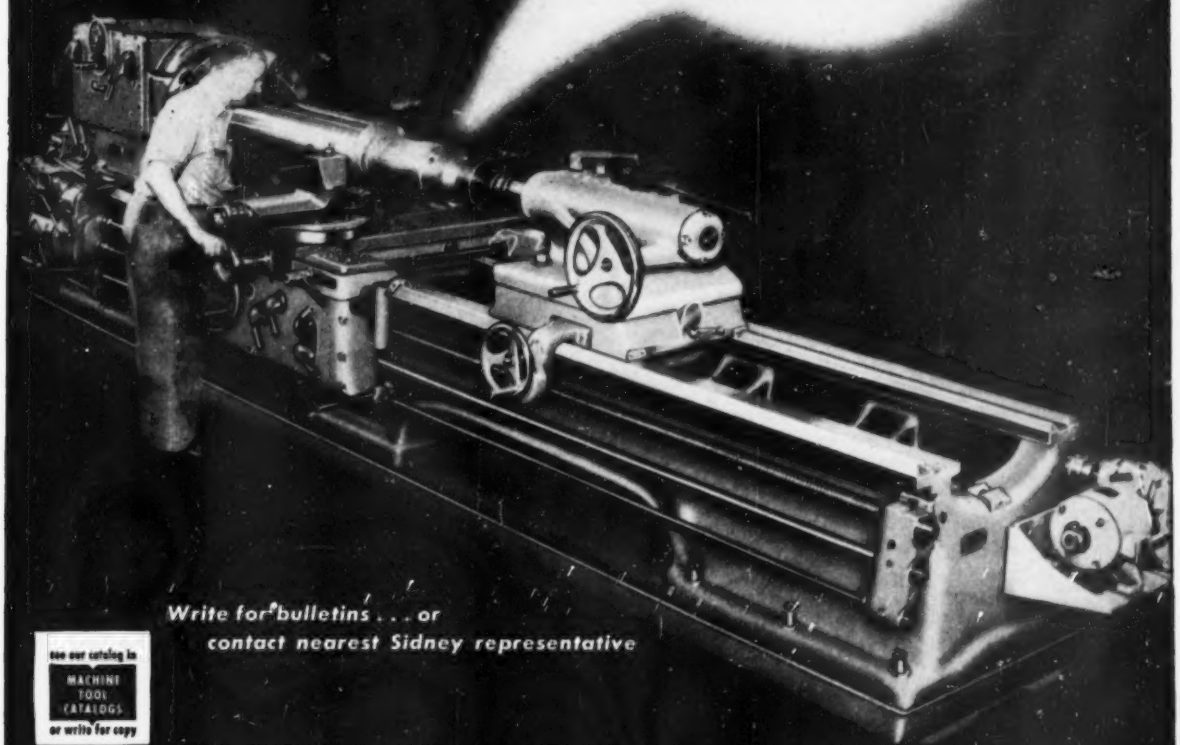
SIDNEY
HEAVY-DUTY LATHES

DESIGNED FOR ACCURACY
•
BUILT FOR LONGER LIFE

Here is a 32-inch Model 16 Sidney Lathe turning columns for 3 and 4-foot sensitive radial drills. Carboloy tools are being used on semi-steel. Speed: 300 feet per min. Photograph taken in plant of Fosdick Machine Tool Co., Cincinnati, Ohio.



FOSDICK RADIAL DRILL



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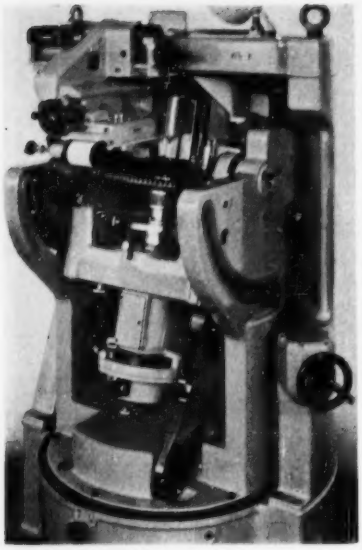


Bevel Gear Testing Machine Checks Gears to 16.5-in. Dia

Maag bevel gear measuring machine KP-42, generally supplied with bevel gear grinding machine KS-42 (*AM*—June 22 '53, p192) records tooth alignment, tooth thickness, tooth profile, and surface finish on bevel gears with straight and oblique teeth. Machine measures the cone angle and generating angle, as well as lateral displacement in the case of oblique teeth, with accuracy of a few hundred-thousandths of an inch. Movements necessary for measuring correspond to those on the grinding machine but are carried out by hand.

Generating and rolling motions of gear to be tested are obtained by pitch blocks, rolling disks, and steel bands and consist of rotation around axis of work and rolling motion around vertical axis passing through the apex. Desired rolling ratio is obtained by altering the diameter of one or two rolling disks. Recording device is mounted on a movable horizontal slide so that points of contact of the feeler are on a line passing through the apex. Error magnification is adjustable between 400 and 600.

For checking tooth alignment, fixing head remains stationary; feeler is moved along tooth flank by turning handwheel. For recording the profile, the slide carrying the feeler remains stationary. The fixing head is adjusted to the corresponding base cone when testing by means of a pointer feeler or to the pitch cone when testing by means of a conical feeler. The generating support of the machine is rotated, by means of a handwheel, around a vertical axis passing through the apex.

The cone angle, the circular pitch, and the lateral displacement in the case of oblique bevel gears are read by optical means. The instrument for reading the lateral displacement is removable. Accuracy for reading angles is 2 sec, for lateral displacement, 0.004 in.

Tooth thickness can be determined by contacting both flanks of a tooth with a special feeler and reading the corresponding rolling angle, or by a special micrometer mounted on the machine.

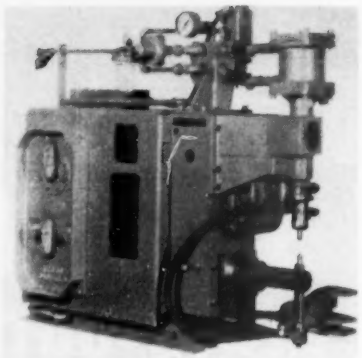
Max no. of teeth is 120, min, 16; max pitch cone angle is 90°, min, 7°; max helix angle is 30°. Floor area of machine is 38x44 in. Height is 72 in. Machine weight is about 4000 lb.

Imported by High Precision Products Co, Westfield, NJ

Radial Saw Blades

Carbide-tipped radial saw blades have a heat-treated blade body designed to eliminate vibration, safety-lock device to prevent flying off of tips, and a special finish to cutting edges. Radialloy-tip is precision-ground, permanently brazed to blade body; back of each steel tooth is constructed so as to add miximum support to tip. Blades available for crosscut, rip, combination, jointer, and trim use.

Radial Cutter Manufacturing Corp, 835 Bond St, Elizabeth 4, NJ



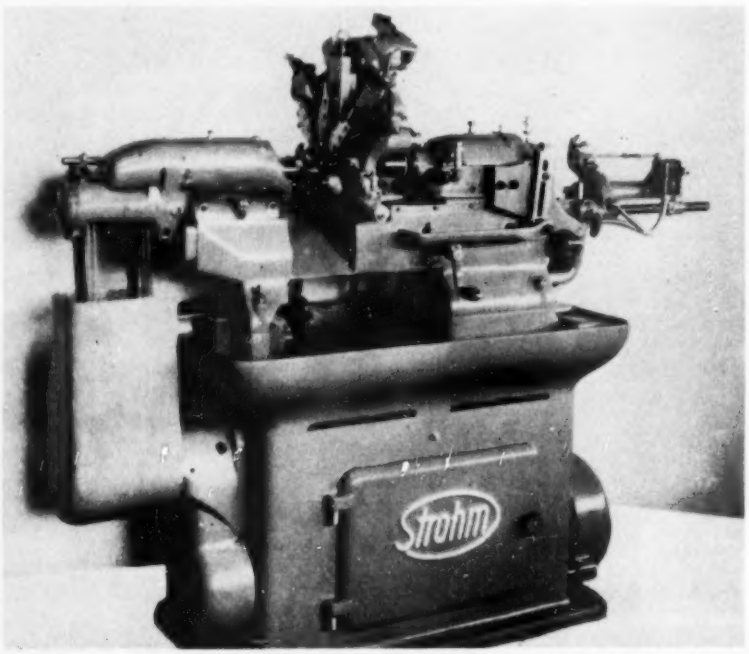
Air-Operated Spot Welder

Taylor-Winfield has introduced type EB-3 air-operated spot welder with throat depth of 8 in. Welding force of either 750 or 1000 lb max is obtained by use of 80-psi line pressure. Electrode stroke is 1¾ in. max.

Lower horn is 2 in. in dia and vertically adjustable to 4 in., plus an additional 1¼-in. vertical adjustment when lower horn holder is inverted. Lower electrode holder is 6 in. long and 1 in. in dia. Upper electrode holder is built as permanent part of upper terminal and is for No. 1 Morse Taper electrode.

A magnetic or electronic contactor, as well as a Sequence-Weld timer, is necessary for the EB-3 welder.

The Taylor-Winfield Corp, Warren, Ohio



LARGER STROHM AUTOMATIC has a round stock capacity of 20 mm (about ¾ in.). Designated M205, machine has five tools; max turning length is 4 in. with flat cam, 6 in. with bell cam — *Imported by Hudson Automatic Machine & Tool Co, 3710 Hudson Ave, Union City, NJ*

Here's How SCHRADER makes Compressed Air...

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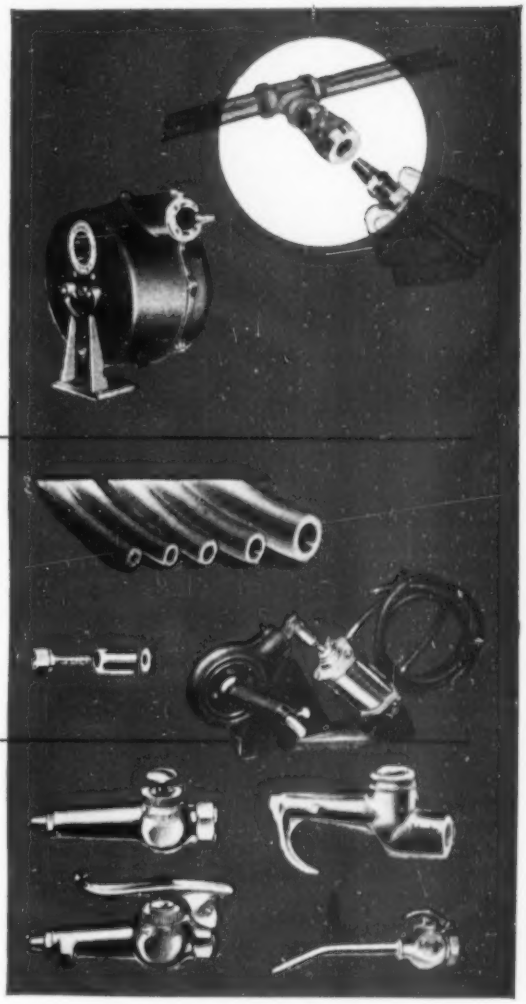
With Schrader Quick-Acting Couplers in airlines along walls, benches, columns—compressed air is "plugged-in" as readily as electricity. To connect—simply push adapter into check unit . . . to disconnect, manually turn sleeve of check unit—accidental uncoupling is impossible. They're available in many sizes, to suit your exact needs.

Keep idle air hose out of the way with a Schrader "Tuck-Away" Hose Reel—yet have it available at all times. Schrader Hose Reels work as easily as a window shade—and come in several sizes with up to 50′ of top-quality Schrader air hose.



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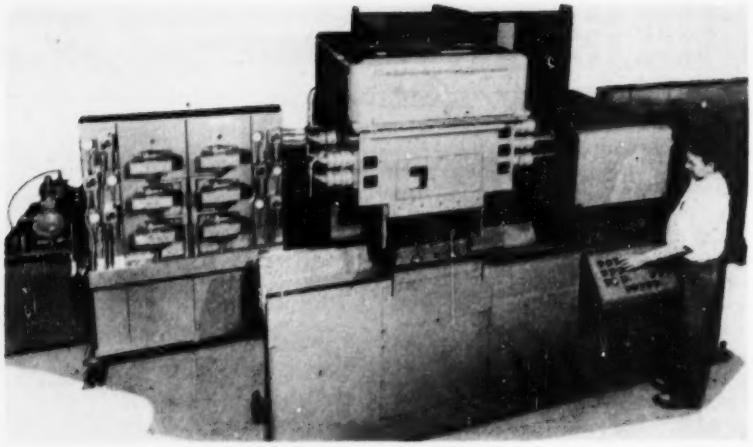


Automatic Nut-Torquing Machine Provides High Production Rates

Hautau Engineering Co has developed a line of nut-torquing assembly machines designed to cut assembly line labor costs and improve product quality of bolted assemblies.

Machines, with hydraulic-powered multiple spindles, will automatically tighten a nut or bolt to a given torque specification, tighten a bolt to a specific elongation, or drive a stud to a given depth. They act as automatic gaging machines and reduce scrap since individual spindles will not drive bolts, studs, or nuts if their thread fits exceed specified tolerances or if the fastener is improperly started.

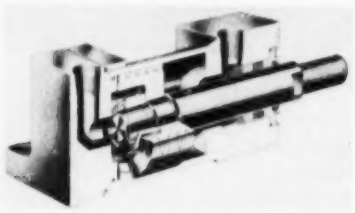
Heart of machines is a patented drive in which each spindle is powered by a hydraulic motor. Motor is either direct-connected to the torquing spindle or a double-enveloping cone-drive worm gear set is provided in the drive.

When driving a bolt, the hydraulic motor is run initially at low pressure and low speed, thus providing a low torque drive and assuring positive engagement between the fastener and the rotating spindle sockets. Initial low torque prevents driving of improperly fitted or cross-threaded fasteners. When sockets have engaged fasteners, an increased volume of oil is directed to fluid motors to rotate the spindles at high speed and provide fast rundown. When the fastener is within one or two turns of depth, a valve is actuated by a depth control finger which directs a high-pressure, low-volume oil flow to the hydraulic motor. Thus a high-torque, slow-speed drive is provided. If the fastener is being tightened to a given torque setting, the hydraulic motor is stalled out at desired torque setting.

Torque capacities are from 35 to 120,000 in.-lb. Torque specifications can be held within a 2% tolerance, length or elongation within 0.0004 in.

Machine illustrated is 20 ft long, 11 ft deep, and 8 ft high. JIC standard hydraulic control system includes subplate-mounted valves on accessible panels at each end. Electrical control panel (JIC) and two hydraulic motor, pump, and tank units are at rear of machine. Each of the two hydraulic power units has three 220-v, 1200-rpm, 10-hp motors direct-connected to 30-gpm, 1000-psi pumps. Each of the three motors and pumps is mounted on a 300-gal. tank.

Hautau Engineering Co, 721 Wanda, Ferndale 20, Mich

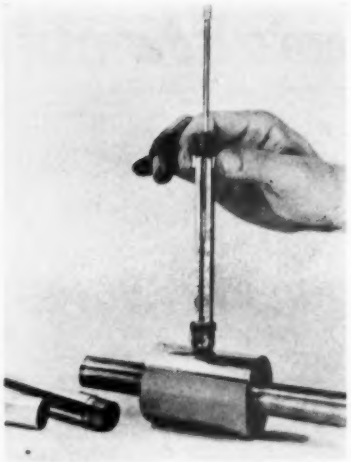


Hydraulic Cylinder Features Easy-Removal Cartridge

Cartridge unit can be removed by taking out a snap ring. Operation can usually be done without dismantling cylinder. Cartridge is machined from high-leaded bronze alloy and provides double bearing surfaces of maximum length.

Line of 2000-psi hydraulic cylinders includes 11 models in 11 bore sizes. All cylinders conform to JIC standards.

The S-P Mfg Corp, Cleveland, Ohio



Pocket-Size Hardness Tester

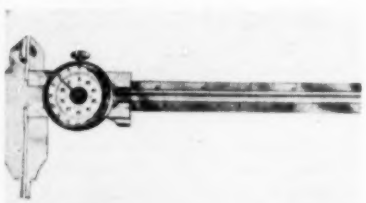
Sklerograf, pocket-size hardness tester, is said to be the smallest gage made to operate on the rebound principle. Instrument is placed in vertical position and rebounding bar, carrying hardened steel point, is raised until held in place by locking device. When locking device is released by pressing a catch, bar falls and rebounds to a point corresponding to hardness of object. Bar is retained here and hardness can be read with accuracy of 1 point Rockwell C by noting position of indicator ring on hardness bar against graduated scale.

Tables supplied with the Sklerograf permit quick conversion of scale reading to Shore, Rockwell C, Rockwell B, or Brinell hardness.

Two models are available. Model M weighs only 5¼ oz including the container which is 6½ in. long and ¾ in. in dia. This model leaves no indentation on surface of tested material. Model D is designed to stand rougher usage and weighs 9 oz; container is 7¼ in. long by 1 in. in dia.

Price of Model M is $65.00; Model D is $75.00.

Imported by Kurt Orban Co, Inc, 205 E 42nd St, New York 17, NY



STAINLESS STEEL CALIPER measures inside, outside, and depth up to 6 in. Graduations mark 0.01 and 1/128 in. Dial has 1¼-in. dia. Price: $19.75—*Imported by Charles H Brown & Co, Inc, 82 Beaver St, New York 5, NY*

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LELAND-GIFFORD No. 3 MVB

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Look into the Leland-Gifford No. 3 MVB. It will not only pay for itself quickly — but give you an extra bonus by taking the load off more costly equipment.

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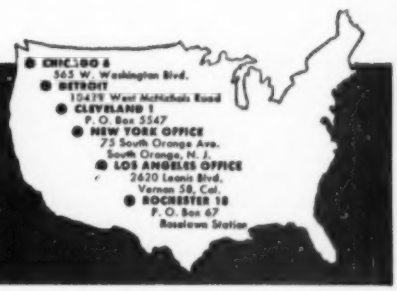
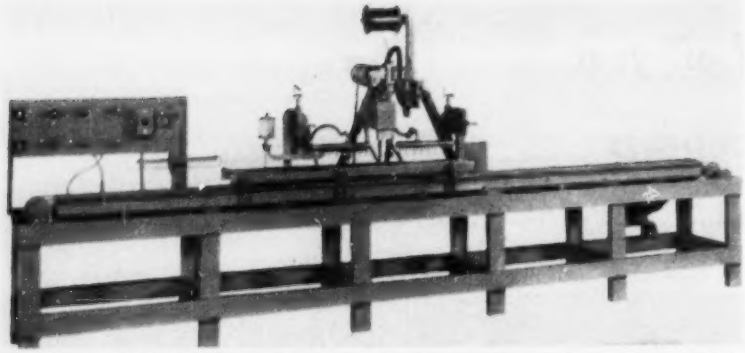


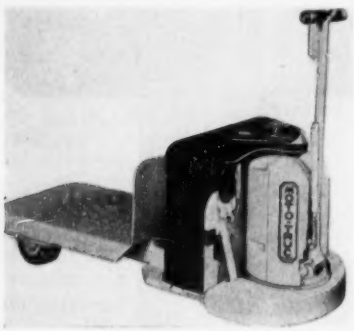
LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



SOLDERING CONVEYOR FIXTURE has adjustable soldering horn with movable rails to conform to the contour of various size parts. Master control panel adjusts flow of gas and air to gun and burners and controls speeds. Gun and burners are moved by microscrew mechanisms. Automatic fluxing device supplies necessary flux. Solder is deposited in seam only with aid of seam locator, a device mounted to solder gun — *Metallizing Co of America, 3520 W Carroll Ave, Chicago, Ill*



Moto-Truc Redesign

Moto-Truc redesign will be applied to the complete "walkie" line. Power unit is said to offer easier maintenance. Cover is taken off by removing four bolts; four mounting bolts provide interchangeability of power units. Time delay switch eliminates possibility of operator starting truck in high speed. Electric tables have been lowered for better protection.

The Moto-Truc Co, 1974 E 59th St, Cleveland 3, Ohio

Carbide Tool Material

Adamas carbide premium Grade 454, originally developed for rough turning operation for shell manufacturers, is being successfully used for rough turning of all types of steel and armor plate. Used on centrifugally cast 309B stainless, feeds ranging from 0.015 to 0.068 per revolution, and speeds from 68 to 600 sfpm have reportedly given unusually good results. Depth of cut used was from ⅛ to 1¼ in.

Adamas Carbide Corp, 1000 So Fourth St, Harrison, NJ

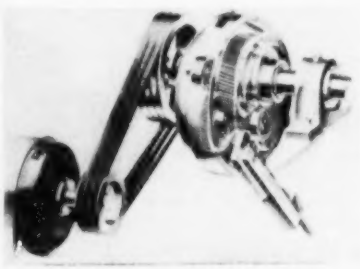
Aluminum Bonding Metal Requires No Flux

It is reported that with the use of a new aluminum bonding metal flux is not required and the surface need not be specially prepared. Bonding metal can be furnished in melt temperatures from 425 to 824 F with shear and tensile strengths from 20,000 to 45,000 psi.

Applications include forming aluminum tubing from sheet stock, castings to castings, castings to extrusions, sheet to castings, and sheet to extrusions.

Application requires heating the aluminum and the bonding metal to the melt temperature of the bonding metal and bringing the two into contact.

Paul E Reimuller, Glendora, Calif



Shaft-Mounted Speed-Reduction Units Have 13-to-1 Ratio

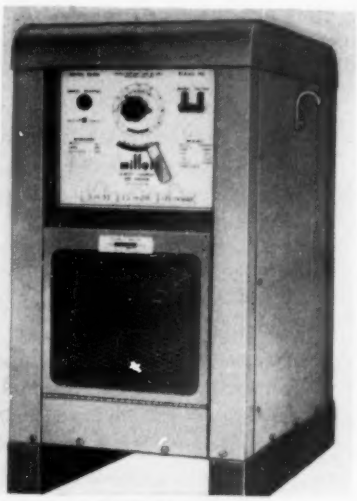
American Pulley Co has introduced Shaft-King, a new 13-to-1 ratio series of shaft-mounted speed-reduction units retaining the advanced features of the original 20-to-1 series. Adaptable to any size shaft up to 3-15/16 in., units are compact and require standard shaft lengths (twice shaft diameter plus clearance) to be mounted directly on the shaft of the driven machine.

Two trains of flame-hardened helical gears reduce the driven shaft speed to obtain the ratio. Gearing and bearings are continually splash-lubricated by the high-speed gear and the counter-shaft pinion which operate in an oil reservoir in the lower third of the housing.

Another construction feature is the patented concentric shaft design which places both the input and output shaft above the oil level. This eliminates the necessity of having bearing seals operate against a head of oil. Additional features include a leakproof, anti-friction oil-sealing system, interchangeable split-tapered bushings, and use of both ball and tapered roller bearings.

Overload release and backstop features are optional equipment.

American Pulley Co, 4200 Wissahickon Ave, Philadelphia, Pa



Selenium Rectifier Welder Features Wide Current Range

Wide current ranges for all types of welding from the thinnest gage metal weldable to the maximum capacity of each welder are incorporated in four models of the Miller welder.

SR-200 has a range from 3 to 300 amp; SR-300 from 3 to 400 amp; SR-400 from 5 to 525 amp; SR-600 from 125 to 750 amp.

Other features claimed are: time-tested pulsating direct current, magnetic amplifier circuit and new current stabilizing coils, remote control units, new range selector switch and dual infinite current controls, Miller-designed polarity reversal switch, and rectifiers specially designed for welding applications.

Miller Electric Manufacturing Co, Appleton, Wis

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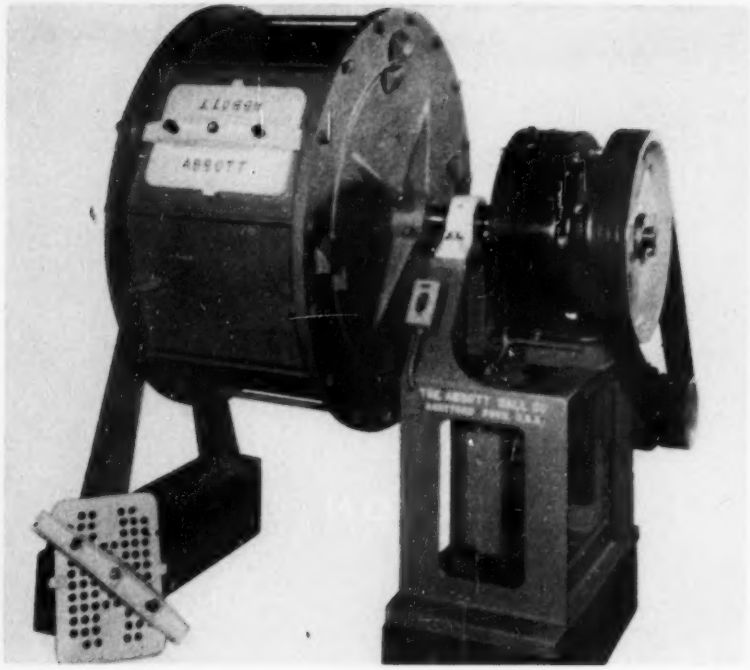


Barrel Finishing Unit Handles Burnishing, Deburring, Cutting-Down

Abbott Ball Co announces an improved barrel finishing unit designed to handle burnishing, deburring, and cutting-down operations. Features include precision speed controls, interchangeable parts, color dynamics, and the high, vertical barrel first developed by Abbott.

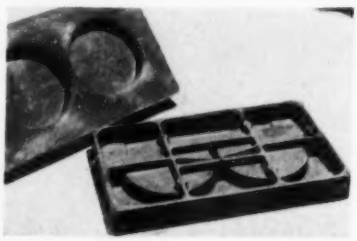
Power is supplied by electric motor mounted on the barrel pedestal. A standard motor base is provided to accommodate several sizes and makes of motor. Precision speed control is maintained by an American reduction drive attached directly to the barrel shaft. Linkage between motor and reduction unit is provided by V-belts and sheaves.

Speed of the barrel is made to fit user's requirements through a combination of sheaves. Unit is controlled with a push-button safety switch which can also be used to jog the barrel to any desired position.

Interchangeability of parts adds versatility and economy to the unit. Side walls and end plates tend to wear out more rapidly than other parts and therefore Abbott claims substantial savings in operating cost.

The new units are made in four standard sizes and are available in ten basic combinations with single, double, and triple compartments to fit the user's requirements. Standard barrel ID sizes for single barrels equipped with maple linings are 24x8, 24x16, 30x8, and 30x16 in.

The Abbott Ball Co, Railroad Place, Hartford, Conn



Plastics Replace Aluminum In New Core Dryer

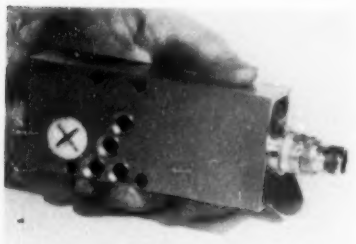
Formed Plastics Co reports that replacing aluminum with plastics in a new type of core dryer cuts material costs 2/3 or more and core-baking time to 1/12 that of former methods.

Plastic core dryers were designed to enable foundrymen to take advantage of dielectric heating to bake the cores for precision castings. Metal core dryers, such as aluminum, which are used in conventional type drying ovens, could not be used satisfactorily in dielectrically heated ovens because the metal would conduct the high-frequency radio waves rather than setting up the resistance which produces the baking heat.

The plastic core dryer is molded of thermosetting Plaskon alkyd molding compound reinforced with glass fiber. Core dryers are made at the rate of 12 per hr on a Stokes Model 726, 200-ton, semi-automatic compression press. Cores are produced from sand containing a binder of water solution of urea-formaldehyde or phenol-formaldehyde resin. Baking at between 250 and 300 F removes the water and converts the resin into the insoluble, infusible state, producing a firm bond.

Cores made in this dryer are being used for casting both ferrous and non-ferrous metals, including magnesium and aluminum. Baking synthetic resin-bonded cores in metal dryers in conventional ovens required from 30 min to 4 hr. It is reported that baking them in plastic dryers in dielectric ovens calls for heating cycles of from 20 sec to 20 min.

Formed Plastics Co, Toledo, Ohio



Hydraulic Servo Valve Provides Flow to 12 gpm

Low-leakage, self-clearing hydraulic servo valve is a two-stage four-way unit with internal mechanical feedback for the transformation of low-level electrical information into controlled hydraulic energy.

Unit is completely sealed against magnetic particles and can be operated without oil filters. Transfer valve exerts clearing force of up to 500 lb in first stage to remove sludge, dirt, or metal particles that tend to jam valve.

Frequency response is said to be flat from 0 to 150 cps. Device has linear output to 14 hp with no external leakage and zero signal leakage of 60 cc per min.

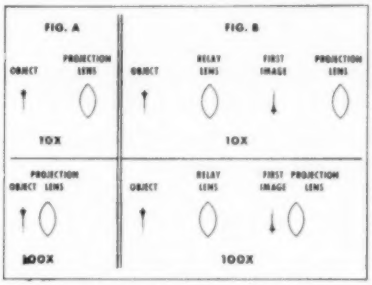
Power amplification is 5000 with pressures to 3000 psi. Input power is less than 2 watts, input current, 15 ma. Valve is 1-5/16x2-7/16x5½ in. with a volume of less than 18 cu in. Weight is less than 1¾ lb. Max flow is 12 gpm.

Sanders Associates, Inc, Nashua, NH

Plain Pointers on Projection

ALTHOUGH we frequently speak of magnifying an object 100× with the Kodak Contour Projector, technically we do not magnify the object at all. Instead we magnify its image, as formed by a relay lens. This relay system, diagrammed in Fig. B, forms an image of the object at a ratio of 1 to 1. The magnifying optics in turn pick up this image and enlarge it from 10 to 100 times.

Since the end result is the same—an enlarged image of a part on the screen—this might seem a roundabout system to the uninitiated. On the contrary, there are logical mathematical reasons for it. One of the more restrictive factors in conventional optical systems is expressed by the formula, M = id/od; that is, magnification equals the ratio of the image distance to the object distance. In practice, where image distance is limited, this entails using lenses of short



focal length for high magnifications. The lens is moved close to the work, decreasing object distance and unfortunately decreasing at the same time the size part which may be checked (Fig. A).

It was to overcome this limitation that our optical experts incorporated the relay system in the Kodak Contour Projector. Since this system merely images the part at unity, the focal length of the relay lens can be comparatively long—in this case eight inches. And the magnifying optics can be moved as close as desired to the image formed by the relay. As a result, users of our projector have a full eight inches in which parts may be staged, regardless of the magnification desired. This permits checking form tools, shafts, and other bulky parts.

If this were all that the relay accomplished, it would be justified design wise. However, it also makes it practical to incorporate in the projector a lens turret in which lenses of varying magnifying power may be mounted. With such a turret, magnification is changed by merely twisting a dial and the part remains in focus at the new magnification. This is a handy feature, and only one of a number of optical features of the Kodak Contour Projector to be discussed in this space.

You can inspect long parts at all magnifications ...with the Kodak Contour Projector

THIS seven-inch-long cycle timing part must be inspected for tooth contour, location and spacing of two cams, shaft diameter, shoulder spacing, and form, size, and runout of the lead screw. All these dimensions may be quickly checked on the Kodak Contour Projector. That's because the Kodak Contour Projector provides an unvarying 8" clearance between lens and object at all magnifications. (The column at the left tells you why.)

The exceptional versatility of the Kodak Contour Projector permits this part to be completely inspected in six positions, at several different magnifications, and using both surface illumination and silhouette projection. And the job requires little training, is done quickly and easily.

Whether for toolroom use or production assembly and inspection, you'll find a Kodak Contour Projector will get the work out in a hurry. With an appropriate chart-gage and fixture you can inspect all sorts of complex parts, large and small. There is a field representative in your area who will answer your questions. To get in touch with him, or for a copy of a new booklet, "Kodak Contour Projector," write to:

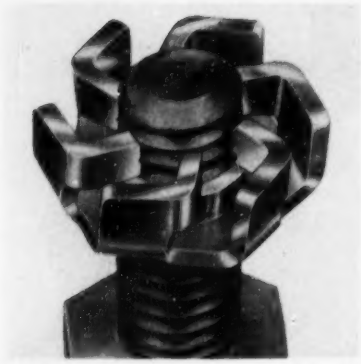
Special Products Sales Division
EASTMAN KODAK COMPANY
Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie, Optical Gaging, shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak

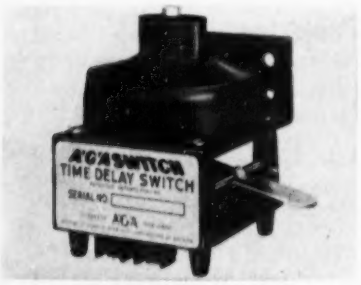


High-Carbon Steel Spin-Down Locknut

Manufacturers of Everlock lockwashers have developed a spin-down locknut which reportedly applies a permanent vibration-proof grip only after nut contacts work. At contact point, ¼-turn takes up all play. As nut is drawn tight, six threaded tines bite into bolt with shrinking action caused by concave base design. As nut is drawn tight, base flattens and forces tines into bolt thread.

Locknut is available in No. 8-10 and ¼-in. sizes in both NF and NC threads.

Thompson-Bremer & Co, 520 N Dearborn St, Chicago 10, Ill



Switch Allows Mechanically Initiated Time Delay

Agaswitch has been developed for applications where manually or mechanically initiated time delay is necessary. Pressure against lever trips switch and time delay period from 0.1 sec to 5 min or more starts upon release of pressure on lever.

Time delay is obtained by restricting airflow through adjustable orifice in timing head. Timing chamber is enclosed and dustproof with air used for timing being recirculated.

Agaswitch is available in both single-pole double break and double-pole single break with resistance loads of approx 15 amp at 115 v. Switch is 2½ in. square and 3 in. high.

AGA Division, Elastic Stop Nut Corp of America, Elizabeth, NJ

Cable-Link Develops Cable Conveyor System

System includes caterpillar drive unit, standard traction wheel assembly, standard trolley assembly, and standard cable-link.

Cable-link is plow steel cable, cut to 16-, 24-, and 36-in. lengths with steel buttons swaged on both ends. Swaged-button ends recess in cavities of malleable steel brackets. Steel nuts, threaded on the tapered sleeves of the brackets exert a 360° pressure on the cable.

Three models (2-, 3-, and 4-in. rail) provide for maximum suspended loads of 80, 250, and 500 lb respectively and maximum pull load per drive of 1500, 2500, and 4000 lb.

Cable-Link Corp, 20175 John R St, Detroit 3, Mich

Ettco-Emrick visible-grip tap chuck centers tap on the round of the shank; floating jaws hold it on the square in a rigid grip, preventing tap from pulling out when reversing. Available in three sizes for taps ranging from No. 0 to 1 in.

Ettco Tool Co, 59½ Johnson Ave, Brooklyn 37, NY

New Truck-Man Models

Two new models were designed to solve the problem of low load limits on elevator floors in the light-weight, low-cost, high-lift field.

Both models are designed around the 360° rotating Truck-Man power turret. Model D-15 is a counterweighted high lift having a capacity of 1500 lb while the truck itself weighs only 1700 lb. Standard model has 84-in. lift with 15-in. load centers. Model DS-20 has balance maintained by stabilizing outriggers which project forward on each side of the load. With a load capacity of 2000 lb, the weight of this model is only 1300 lb.

Lifting and raising is accomplished by a Vickers full hydraulic power pack, with 1½- and 2-hp motors. Control is by pedals mounted at end of table. Remote control by a two-button station can be furnished.

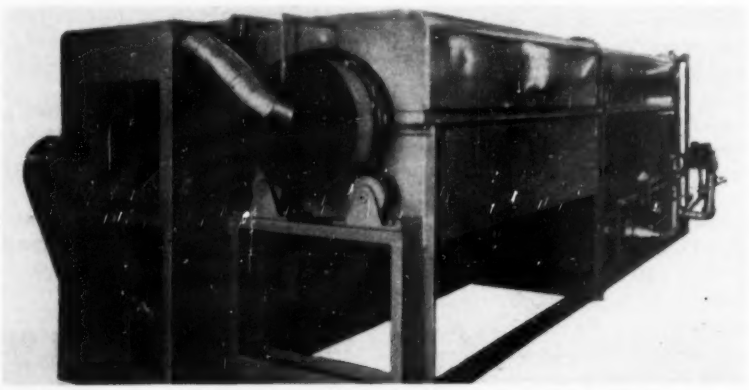
Beacon Machinery, Inc, East St Louis, Ill

Thor Weld Flux Scaling Hammers Are Light and Compact

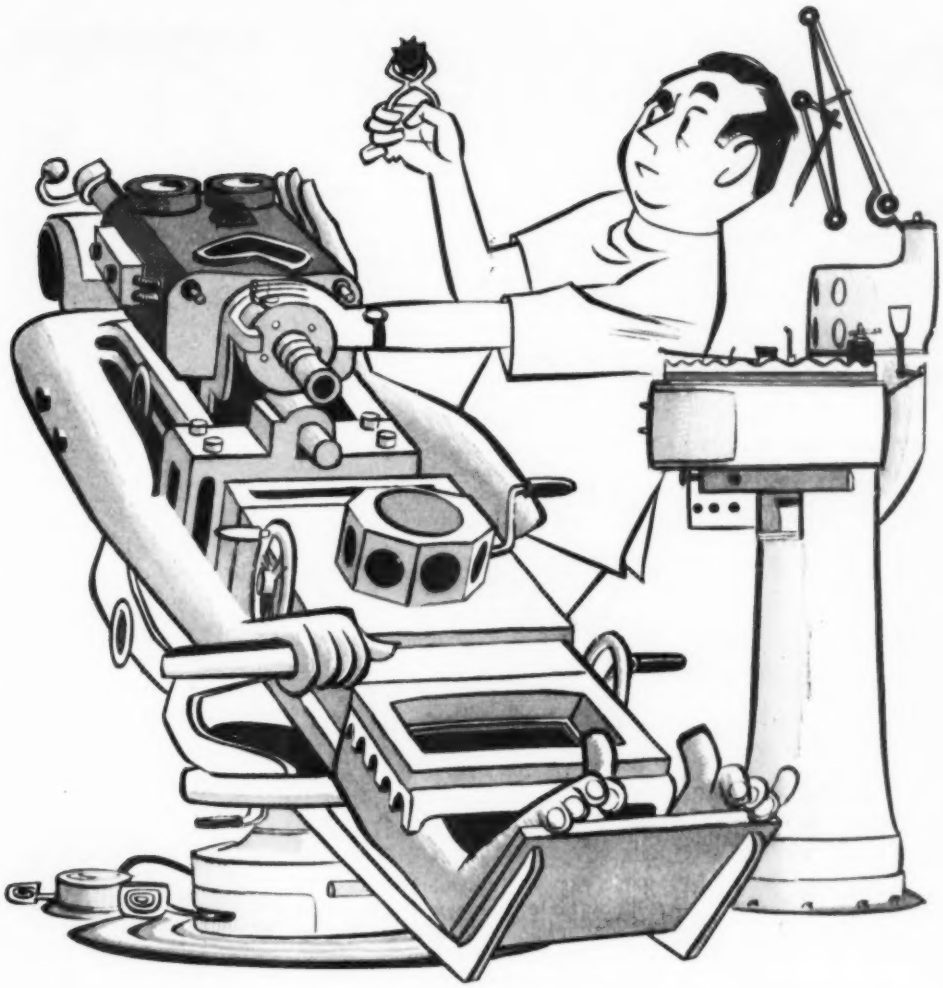
Thor has developed three new air-operated weld flux scaling hammers which are 7¾ in. long and weigh 2⅛ lb. Hammers are said to be especially handy for corner welds and one-hand operation.

Exhaust air, blown from four holes in front of barrel, removes loose chips and scale to maintain surface visibility. Models incorporate lever throttle, push throttle, or button throttle. Straight, angle, or mortar chisels may be used.

Thor Power Tool Co, Aurora, Ill



COMBINATION ROTARY DRUM AND FLAT BELT WASHING MACHINE was designed to remove drawing compounds, cutting oils, grease, and shop dirt from metal parts. Small parts that can be tumbled are washed, rinsed, and dried in the drum; larger parts are processed on the conveyor — *Metalwash Machinery Corp, 901 North Ave, Elizabeth 4, NJ*



It hurts twice as much today!

Double reason why you need Correct Lubrication!

Look up some of your bills for machine repairs during the last so-called "normal" year. *You'll be surprised!* The ring gear that cost you $83 to replace in 1939 now costs $165. A thrust bearing that cost $44.35 now runs $88.73. A millwright's hourly rate in 1939 was 70¢. Now it is $1.56 per hour.

Yes, it sure hurts twice as much today to pay for machine maintenance—*double* reason why you need a program of Correct Lubrication! Such a program assures your use of the right oil or grease for every part of every machine . . . thus steps up machine efficiency—keeps repairs and downtime to an absolute minimum.

Why not get a program of Correct Lubrication started in *your* plant? Call your Socony-Vacuum representative!

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates:
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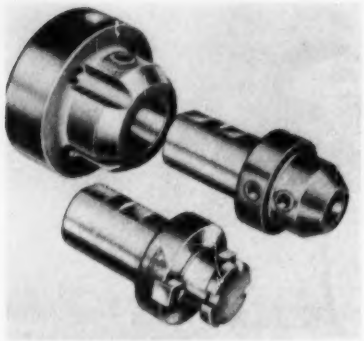
Correct Lubrication

First step in cutting costs!

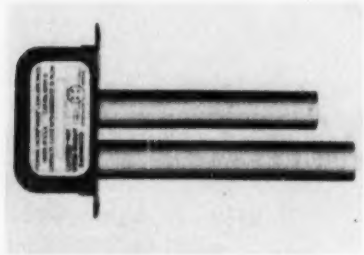


End Mill Adapter Cuts Setup Time

Heavy-duty end mill adapter developed by Goddard & Goddard reportedly cuts setup time and tooling costs. Adapter is standardized for No. 50 N S drive milling machines and holds 2-in. straight-shank end mills in addition to the specially developed and standardized shell end mill arbors and end mill holders for smaller diameter end mills.

Adapter mounts directly on front spindle flange. Four bolt holes and key slots provide for rigid mounting and positive drive. Two setscrews firmly hold straight shank end mills and auxiliary equipment. All locating surfaces are finish-ground parallel and concentric for true mounting and accurate cutting.

Goddard & Goddard Co, 12280 Burt Rd, Detroit 23, Mich



Unit Doubles As Liquid-Level Detector and Airflow Control

Detect-A-Flo can be used as a warning device in air-cooled equipment, a ventilation control, and similar applications where a particular flow rate must be maintained. It may also be used as a liquid-level detector in storage and supply tanks.

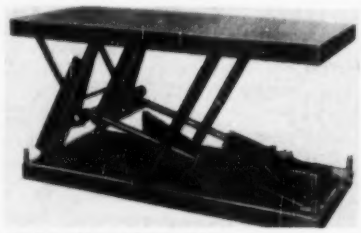
Viscous fluids reportedly have little or no effect on the operation of unit. Unit responds to a change of less than 0.1 in. in level. Response to flow of air can be set in range from 1000 to 50,000 lb per hr per sq ft. This range corresponds to a range from 4 to 180 fps for standard airflow.

Unit does not depend on a pressure drop for its operation. One leg is continuously heated by a small internal heater. As the flow rate drops, the heated leg expands. Resulting expansion is transmitted through lever action to a strut-and-electrical-contact assembly in the other leg. This movement relaxes the tension in the struts and causes the contacts to open.

Changes in ambient temperature are compensated for by the construction within the range of –65 to +175 F. Operating sensitivity at room temperature is less than 0.25 fps at low flows and less than 1 fps at higher flows.

Unit is 2x2¼x5¼ in. and weighs 8 oz. Power source is 28-v ac or dc or 115-v ac. Connector is terminal block or standard AN.

Fenwal Inc, Ashland, Mass

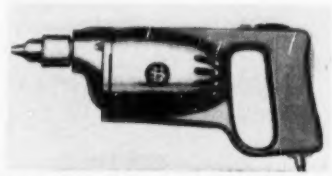


Hydraulic Lift Table Has 9-in. Minimum Height

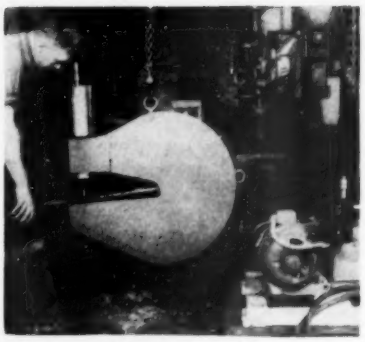
Beacon lift table in lowered position measures 12½ in. from floor to top of table and can be made to achieve minimum height of 9 in. by displacing hydraulic pump unit to platform attached outside unit. Table can be raised to 43 in. and comes in standard 4000- and 10,000-lb capacity models. Size of unit is 36x84 in.

Power is provided on either truck by air-cooled engine which reportedly will operate a full 8-hr shift on 1 gal. of gas. Other features include pneumatic tires on drive wheels, rubber-tired load wheels, and 360° steering.

Truck-Man Div, The Knickerbocker Co, Jackson, Mich



ELECTRIC DRILL (¼-in.) features full ball-bearing construction, aluminum alloy frame, heat-treated alloy steel gear, Jacobs 3-jaw geared chuck, and universal motor. No-load speed is 2500 rpm. Price: $28.00 — *U S Electrical Tool Div, Emerson Electric Mfg Co, St Louis 21, Mo*

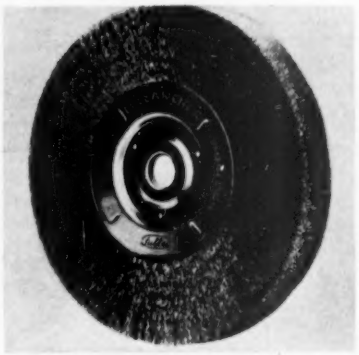


Mob'le Guillotine Punch Provides 75-ton Thrust

Manco guillotine punch, designed for production use and taking test slugs during rolling operations, combines heavy thrust with relatively light weight and mobility. Punch unit is 1650 lb. It provides 75-ton thrust and is capable of punching a 1-in. hole through a ¾-in. mild steel plate. Punch range is 13/16 to 1¾ in. Operating cycle takes 3 sec per punch.

Punch is powered by 2-hp electric hydraulic pump unit which can be foot-valve operated. Valve is specially designed mechanical type and does not utilize solenoid switches.

Manco Mfg Co, Bradley, Ill



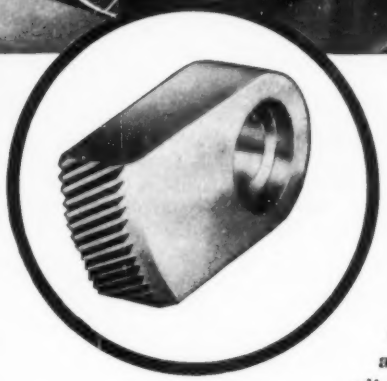
Fuller Wheelbrush Has Exchangeable Sideplates

Fullanchor wheelbrush offers two design features which are said to provide longer brush life, increased maximum wheel speeds, insured balance, and extra safety at no increase in cost.

As the trim wears down, larger sideplates can be exchanged for smaller ones, thus exposing a new length of trim. Balance is achieved by clamping an almost identical number of filaments in each tuft, then anchoring each tuft to the core with evenly spaced heavy wire staples driven through a continuous steel channel.

Fuller Brush Co, Industrial Div, Hartford 2, Conn

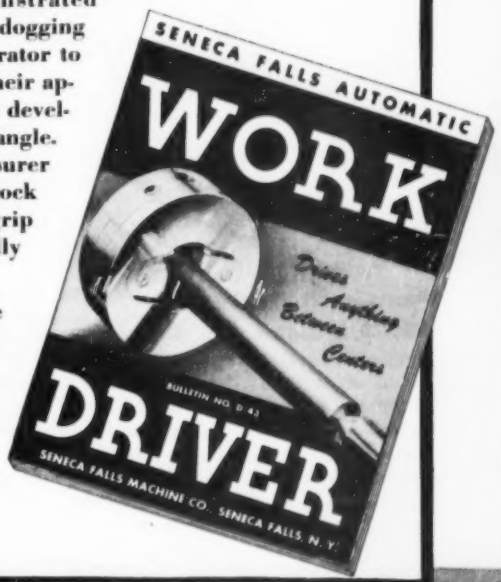
SENECA FALLS
Automatic
WORK DRIVER
Drives Anything Between Centers



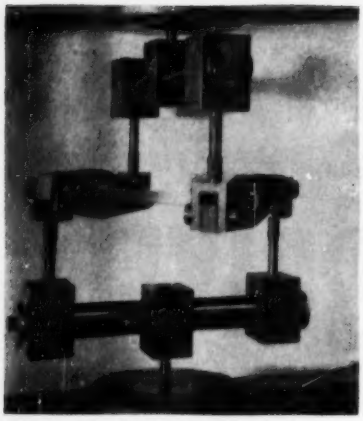
Jaws with angular serrations ... NOW STANDARD

● These self-centering, quick-acting Drivers have long demonstrated their ability to eliminate dogging time and to enable one operator to attend multiple machines. Their application has been widened with development of a new jaw having serrations milled at a suitable angle. These angular serrations provide an overlapping contact for surer and quicker grip on smooth finished, as well as hot rolled stock and forgings having a relatively hard surface. This positive grip eliminates slippage and resultant tool breakage . . . especially important when costly carbide tools are used.

Seneca Falls Work Drivers are designed for use on any engine or multiple-tool lathe and for certain work on turret lathes and grinding machines. In addition to time-saving, the Seneca Falls Automatic Work Driver provides greater safety for the operator since there are no projecting screws or sharp corners to catch clothing or injure hands. Made in 18 standardized models for work diameters ranging from ¼ to 6⅞ inches. Write for Bulletin D-43.



SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

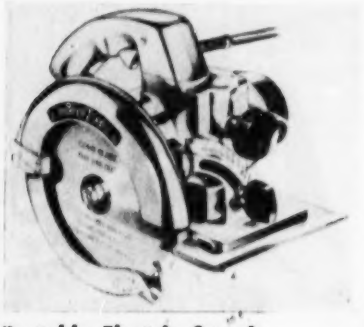


Device Produces Torsion On Tension Testing Machine

Schaevitz torsion device twists, to a max angle of 24°, test specimens ranging from 2 to 12 in. long (plus 2 in. to be engaged by torque bars). Max torque load is 60,000 in.-lb, obtained by applying a 12,000-lb tension load. Device is furnished with hardened socket liners for specimens with square ends measuring ⅜, ½, ⅝, or ¾ in.

Ends of test specimens are secured in centers of two parallel torque bars. Torque bars are rotated in opposite directions by means of four tension members that are pivotally connected in the ends of two equalizer bars. Pivotal connections are also provided for the two spherical-headed tension rods seated in wedge block adapters in testing machine crossheads.

Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa



Portable Electric Saw Is 7-in. All-Purpose Unit

Porter-Cable electric saw, model 115, is an all-purpose heavy-duty saw. It weighs 12½ lb and is 11 in. long. Telescoping guard is designed to move into the cut without drag. Finger control lever permits the operator to pull back the guard with safety. Instantaneous bevel and depth adjustments are provided. Entire frame is made of die-cast aluminum with center-balanced full-hand grip and trigger switch.

Several accessories are available. A portable steel table weighing 42 lb has a calibrated angle gage and accurate rip fence. Three types of abrasive blades enable the saw to cut stone, metal, and tough compositions. A radial-arm table is also available. Other accessories include steel carrying case, rip guide, crosscut guide, and wide assortment of blades. Price of saw: $75.00.

Porter-Cable Machine Co, 2½ Exchange St, Syracuse, NY

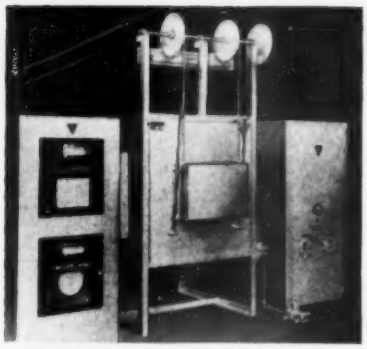
Rusnok ST Mill Head Made With 1-HP Motor

Rusnok ST mill head is now being made with a full 1-hp motor with capacity to ¾-in. end mill in steel. This is in addition to the standard ½-hp motor furnished on the ST heavy duty and the ¼-hp which is standard on the low priced No. 70 Convertical model.

Rusnok Tool Work, 4840 W North Ave, Chicago 39, Ill

Model No. 735-S universal and production tester for spiral and torsion springs is designed for springs up to 1 in. long and 2-in. OD. Tests capacity up to 2000 gram-cm in increments of 0.1 g-cm; deflection is applied by means of handwheel, and is read to ½°. Spring under test is in full view, and calibrated chain post permits quick reading of all loads.

Engineering Dept, John Chatillon & Sons, 85-93 Cliff St, New York 38, NY



Pereny Furnace Works Continuously At 2500 F

General purpose heat-treating furnace, Model FG-430 is designed to handle all requirements, including HSS, at continuous heavy duty up to 2500 F. Unit handles higher temperature work over shorter periods.

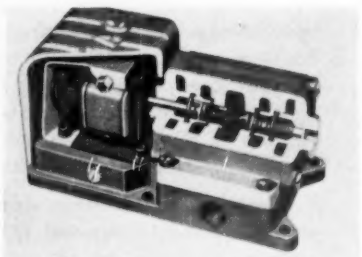
Loading area is 14 in. wide, 24 in. deep, and 12 in. high and outside dimensions are 50 in. wide, 52 in. deep, and 84 in. high.

Case is of heavy electrically welded steel. Gas-tight ports are provided for connecting atmosphere-reducing sources. Counter-balanced door is foot-controlled and air-operating. Flame curtain is located immediately below the opening and ignites automatically when the door opens.

Globar elements with air-cooled terminals are located beneath the hearth and above the chamber to effect maximum heat transfer. The elements, which extend completely through the furnace, may be replaced without unloading or otherwise disturbing the furnace.

Power controls include voltage-regulating transformer with 36 taps and fine and coarse switches.

Pereny Equipment Co, Columbus, Ohio



SOLENOID-OPERATED AIR VALVE embodies aluminum alloy surface-hardened spool on which sealing material is integrally molded and bonded. One moving part is serviced by removing the retainer. Bores of body and retainers are bearing-ized — *Mechanical Air Controls, Inc, 15311 W 11 Mile Rd, Detroit 37, Mich*

La Salle MANUFACTURES QUALITY

COLD FINISHED STEEL BARS . . .

ROUNDS, FLATS, SQUARES, HEXAGONS, SPECIAL SHAPES LaSalle offers a complete range of cold-finished steel bars in popular sizes, shapes, and lengths. Also, special shapes to order.

COLD-DRAWN—TURNED AND POLISHED —GROUND AND POLISHED Modern drawing, turning, and grinding equipment, and skilled workmanship insure quality steel bars in standard grades.

CARBON AND ALLOY STEELS LaSalle manufactures quality cold-finished bars in AISI and SAE carbon and alloy steel grades.

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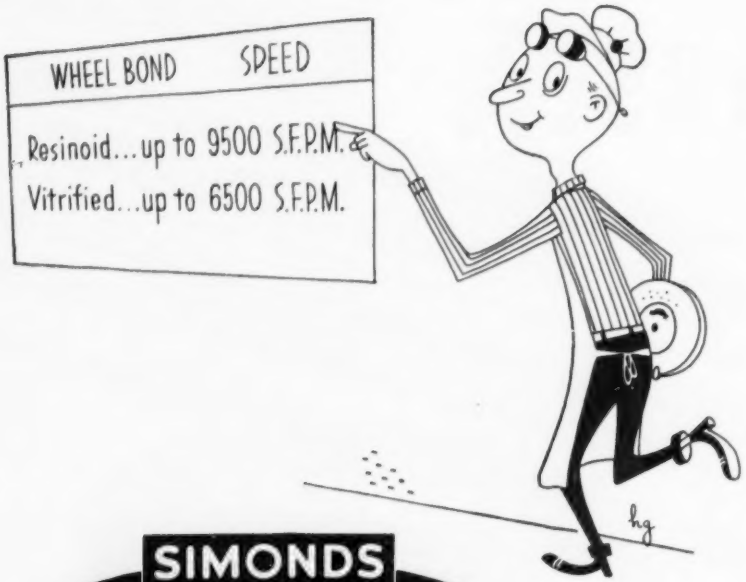
"S.F.P.M." means something else too!



SIMONDS ABRASIVE CO.
Grinding Wheels

As you know, the letters "s.f.p.m." stand for surface feet per minute. For you, "S.F.P.M." can also mean "Simonds for production maximum" with Simonds Resinoid and Vitrified bonded grinding wheels. And this is proven productivity . . . consistently shown in field surveys of industrial plants where Simonds wheels are used. Put these proven producers to work on your high speed and low speed grinding jobs. They're part of Simonds' complete line including grinding wheels, mounted wheels and points, segments and abrasive grain . . . all accurately specified to meet your job needs exactly.

Write for data book and name of your Simonds Distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N.Y. Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

Lightweight Mall aerial grinder with fully enclosed commutator and switch is available in three sizes. The 6x1-in. wheel has a ⅝-in. hole, spindle speed of 3730 rpm free; 5x1-in., ½-in. hole, 4430 rpm; 4x1-in., ½-in. hole, 5560 rpm. Unit weighs 12 lb; length, 22 in., width, 4¾ in., height, 4½ in.

Mall Tool Co, 7725 S Chicago Ave, Chicago 19, Ill

Usalite Duo-Flex has a 1000-ft beam and flexible slide-out side-arm for inspection of inaccessible parts and equipment. Over-all extension of the probe-light arm measures 10½ in. Plastic-housed unit has reflector for long-range lighting, detachable end cap with spare bulbs, and flasher button for code signalling.

US Electric Manufacturing Corp, 222 W 14th St, NY 11, NY

Shelter sign, which can be permanently self-affixed to any smooth surface, is furnished in two parts to permit pointing in any direction —up, down, left, or right. One 20x5-in. section reads "Shelter" in 4-in. block letters; arrowhead is printed on a 5x5-in. sign.

Halco Co, 165 Dwight St, New Haven 2, Conn

Magnus cutting compound No. 8 has been developed to reduce downtime on broaching operations caused by necessity for cleaning broaches. Product, in one company's experience, has completely eliminated tool-cleaning, even when working on toughest of steels; machine can be operated until broach needs sharpening.

Magnus Chemical Co, Garwood, NJ

Commercially pure titanium, precision-rolled to thin gage and foil, is available in strip up to 8 in. wide and down to 0.0005 in., to tolerances of ±0.0001 in. Furnished in any quantity from 1 lb to thousands of pounds.

American Silver Co, Industrial Div, 36-07 Prince St, Flushing 54, NY

Zipon emergency V-belt kits for replacing broken belts without dismantling machinery, contain a planned footage of detachable V-link belting, simplified tool for attaching, and folder of instructions. Four kits of various size belting permit replacement of all FHP and most multiple V-belts.

Brammer Corp, 684 Broadway, New York 12, NY

Line of bleeder valves is available in four models. No. 150 micrometer adjustment needle valve has stem with very fine taper; threading is 5/16-40 threads per in., resulting in extremely fine adjustment of 0.025-in. rise per revolution. Available in many sizes for 1500 psi service. Units 152 and 153 are recommended for service up to 3000 psi at temperatures from –65 to + 180 F. AN 6204 is the standard hydraulic bleeder specified by Army-Navy.

Republic Manufacturing Co, 1930 W 77th St, Cleveland 2, Ohio

Series of safety solvents is being marketed for degreasing and cleaning of electrical equipment and all metal parts. Line has flash points ranging from 140 to 280 F. Harco Metal Cleaner, L-D Safety Solvent, and H-D Safety Solvent are available in 55-gal. drums; 5-gal. drums for trial at regular drum price.

Harco Chemical Co, 338 North Ave, E, Cranford, NJ

Quality control computer, a circular slide rule, called Qualitrule, presents in one setting the upper and lower limits for the number of rejects to be expected in a sample of given size. Rule covers sample sizes from 2 to 1000, averages from 0.3 to 20%, upper limits from 2 to 200 units, lower limits from 0 to 50 units. All figures are directly read off without intermediate computation. Price, $4.95.

American Hydromath Corp, 145 W 57th St, New York 19, NY

Labyrinth-type sealed bearing for casters and wheels has been designed to eliminate necessity for specially prepared surfaces to insure proper sealing. Unit is free-running, with minimum of friction or drag; can be re-greased by standard grease gun technique through regular Alemite pressure fittings. Seal can be easily replaced without disassembly.

Bassick Co, Bridgeport 2, Conn

Alfco Model PCB-1, a one-quart, trigger-operated fire extinguisher for Class B and C fires, is a stored-pressure unit charged with bromochloromethane (CB). Operates at high and low temperatures, will not freeze down to –65 F., discharges 95% of contents in any position from vertical to within 15° of horizontal.

American-LaFrance-Foamite Corp, Elmira, NY

Westinghouse has everything for arc-welding anything... ...anywhere

No other company knows arc welding better than Westinghouse. That's why Westinghouse is able to supply equipment for every phase of arc welding . . . to provide the most complete line of arc welding in the entire industry.

We offer the benefits of practical welding engineering in industrial and limited input, a-c machines, d-c selenium rectifier welders, engine-driven welders, electrodes, welding accessories and brazing alloys and flux. A corps of skilled welding-wise specialists and distributors are available for trouble-shooting your knottiest welding problems.

Westinghouse Welders by the hundreds of thousands are serving and saving wherever metals are joined. Why not investigate for yourself the benefits of doing business with us? Just call your nearest Westinghouse Welding Distributor, or write Westinghouse Electric Corporation, Welding Division, Box 868, Pittsburgh 30, Pennsylvania. For helpful literature, just fill out the coupon below. J-21811

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☐ B-5451 Welding Accessories
☐ B-5452 General Purpose WT-Type A-C Welders
☐ B- 5838 Type EW-20 Engine-Driven Welder
☐ B-5622 Type HC Industrial A-C Welders
☐ B-5453 D-C Arc Welder Type RA

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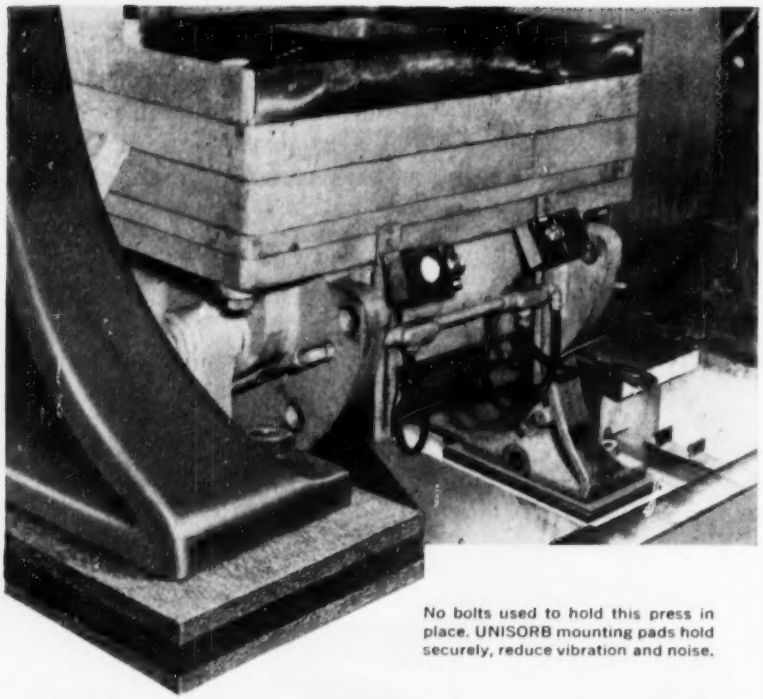

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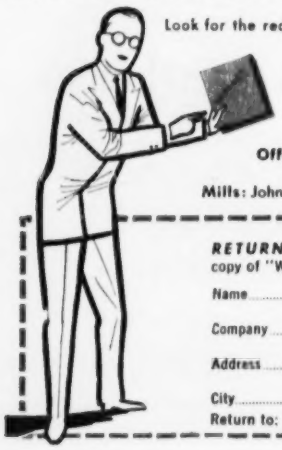
UNISORB is also available pre-coated with adhesive, and is recommended for use only with machines that do not require shimming.



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Utica diagonal or side-cutting pliers can now be equipped with a rubbery Plastisol cushion throat. Insert acts as a third hand to hold short end of electrical or spring wire during and after cutting. As pliers close, cushion grips short end tightly, holding it as cut is made; in most cases, pliers must be opened to release wire end. May be ordered on Utica pliers for $1 list additional.

Utica Drop Forge & Tool Corp, Utica, NY

Torcon 11D heavy-duty hydraulic torque converter is now being used in the FT series Buda fork-lift trucks. Single-stage, three-element unit combines hydraulic converter and coupling in a single unit; has single-piece, aluminum-cast wheels; heavy-duty bearings with forced lubrication; no lip-type seals exposed to high-pressure oils.

Torcon Corp, 493 East Fifth St, Ashtabula, Ohio

Standardized thread rolling attachments are available in three sizes: Models A and B are designed for automatic screw machines of 1¼-in. capacity or more; Model C, for machines of 9/16 and 1-in. capacity. Model A attachments have available a choice of 27 interchangeable standard pitch thread rolls; Model B has 18; Model C, 17.

Salvo Tool & Engineering Co, Roseville, Mich

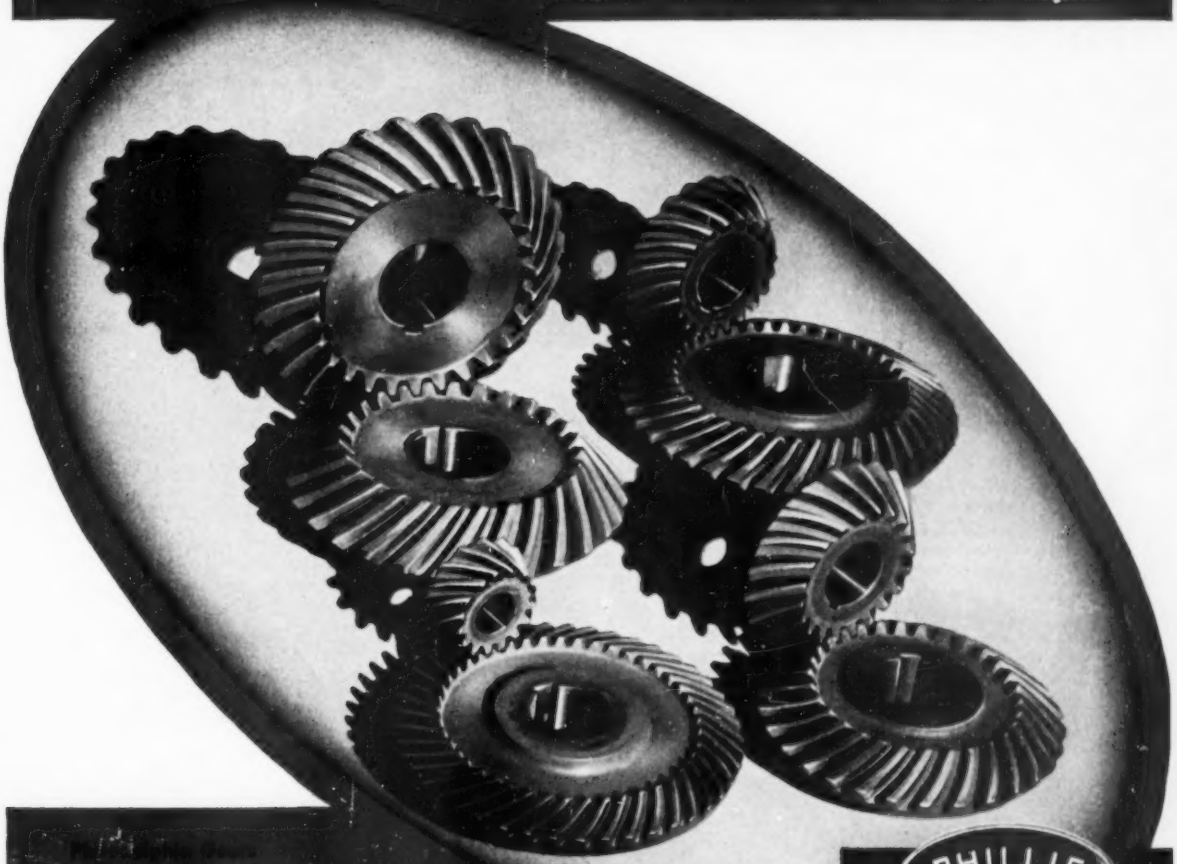
Tuff-Kut 77 is a tough-film, water-soluble, transparent cutting fluid, developed for all types of production machining and grinding operations wherever a water-type compound is permissable. Said to be particularly useful as a broaching lubricant for both horizontal and vertical work.

Lubricants, Inc, 1320 Oakman Blvd, Detroit 6, Mich

Compound L-88 is a liquid product for electrolytic stripping of defective copper, nickel, and chromium plates from zinc base die castings. Defective castings are made the anode in the solution at 6 v; when surface is exposed, a passive film is formed inhibiting further attack. Stripping solution is operated from room temperature to 180 F, and is said to be extremely economical because of no deterioration in use of stripper. Available as a liquid supplied in standard 13-gal. carboys.

Enthone, Inc, 442 Elm St, New Haven, Conn

ACCURACY



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Martindale Electric Co, 1375 Hird Ave, Cleveland 7, Ohio

Western sheet handler, designed for vertical storage of all types of material, is said to greatly reduce damage to surface finishes and handling expenses. Can be used portably or installed permanently. Providing up to 200% more space utility than skids handling the same amount of material, unit has 2500-lb capacity, weighs 11 lb.

Western Manufacturing Co, Arkansas City, Kan

Piston-type oil relief valve for regulating pressure on Eclipse series CF closed flame gas-oil burners has been designed to eliminate chattering and pulsation. Five different spring sizes permit range of pressures from 0 to 500 lb. Piston and spring are easily removed for servicing without dismantling entire valve. Available in four sizes from ⅜ to 1-in. port.

Eclipse Fuel Engineering Co, Rockford, Ill

EC-1120 dielectric sealer is a synthetic rubber material designed for use as a flexible potting compound on electrical wiring connections. Applied in liquid form, it cures by chemical reaction to a tough consistency; said to retain physical properties throughout temperature range of –65 to 200 F, and to incorporate excellent dielectric properties, moisture and water resistance, and durability. Flexible sealer eliminates wire breakage due to bending or vibration.

Adhesives & Coatings Div, Minnesota Mining & Manufacturing Co, 423 Piquette Ave, Detroit 2, Mich

Six Proto torque-limiting wrenches, calibrated in in-lb are available with capacities of 100-750 and 700-1600 in-lb. Three models have a plain head, and three a built-in reversible ratchet head; drive sizes are ⅜ and ½ in. Tools release at proper setting and reset automatically.

Plomb Tool Co, Washington & Santa Fe Aves, Los Angeles, Calif

Accuracy ± .000008"

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Keep a second set with wanted sizes available on instant notice. Avoids delay or even error that might result from using substitute gaging methods.

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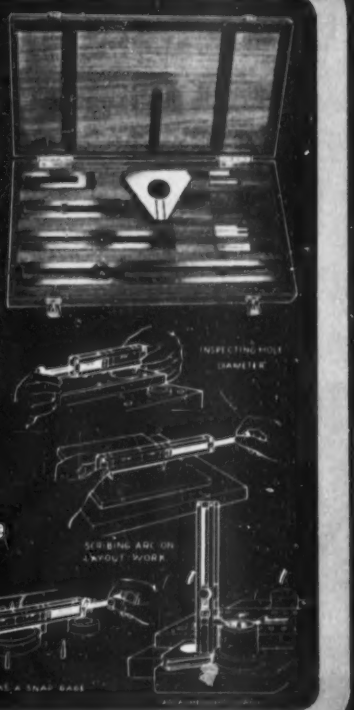
If you use gage blocks you'll want the time saving convenience of this accessory set. It simplifies gaging by enabling you to apply the blocks directly to the work as a snap and plug gage, height gage, scriber and trammell. The set includes 4 gage block holders, base, straight and round jaws, centerpoint and scriber.



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Whatever you saw, there's an Atkins saw that does it better!

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ATKINS SAW DIVISION, BORG-WARNER CORPORATION
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WHERE AM COMES FROM

Where do *AM* articles come from? Well, that's not a question that can be answered easily; sources are too diverse. Departmental material is easier to pin down, so let's start with that.

Our Washington and Detroit pages come by teletype from our own bureaus in those cities, as do some of the items in our regular news pages in back. Spot News, Machine Tools, Editorial and Talking Shop pages are written in New York, from data we collect on trips to Metalworking plants and by phoning to follow up leads. News stories are extracted from all sources, including plant visits, correspondence, and local newspapers. Personal and Business News paragraphs, New Bulletins and New Shop Equipment descriptions are principally from correspondence, although longer items in the latter department frequently involve personal visits and phone calls from specialist editors. When new engineering principles or production processes are involved, we check particularly closely to be sure we have all the data you'll need for preliminary evaluation, because the usual release is not particularly detailed.

Round Table narratives are written around shop problems, usually those dealing with personnel. The ideas may be ours or contributed, and the writing likewise. Book reviews are staff written by the editor most qualified to handle the subject —except for books in foreign languages, where we frequently depend on outside engineers familiar with both subject and language. Reference Book Sheets are largely abstracted from new national, association, or company standards, but nomographs and some tabular material are paid contributions by specialists.

SPECIAL REPORTS

Our concept of the Special Report is a condensed handbook, covering the A to Z of a particular material, process, method, or idea. Hence it is usually a roundup of information from all available sources, involving

trips, phone calls, correspondence, and a great deal of checking back on the part of the editor assigned the topic. Occasionally the Report is written by an outside authority, but in most cases the problem is to find the man who can write a broad-gage report. In most plants, the expert in a particular field deals with that field only from the point of view of his own plant, rather than from that of the industry in general, unless the subject is a fundamental or abstract one—like our current series on understanding various classes of metals. As a consequence, the field expert is likely to develop too much detail on one facet of the subject. Editors, on the other hand, are trained to summarize — to make only the broadly applicable points across the entire field, selecting material from company reports, technical papers, personal observation, and any other appropriate sources.

ARTICLES

AM articles are staff-written in about half the cases, contributed in the other half. Who writes the article, providing only that he does a competent job, is unimportant; the essential problem is to find subjects that are either applicable or of interest to a large proportion of our readers, to present those ideas as compactly as possible to save your reading time, and to balance your reading diet. The second job—that of presentation—is an editorial function and takes a great deal of time and experience, but does not particularly concern the man who produces the original idea. In our case, the first step is vital—that of sleuthing among metalworking plants to find the new and useful ideas. Many of our articles originate with the editors; others may come from readers, manufacturers, or other sources; some of the best are inspiration or coincidence.

Actual writing of the material and development of suitable illustrations

"Back to your lathe, Chips, I'll let you know when the ice-cream man gets here."

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Atkins gives you the right band saw for every metal cutting job—the blade that cuts cleaner and trims down do-overs, that cuts time and keeps down production costs.

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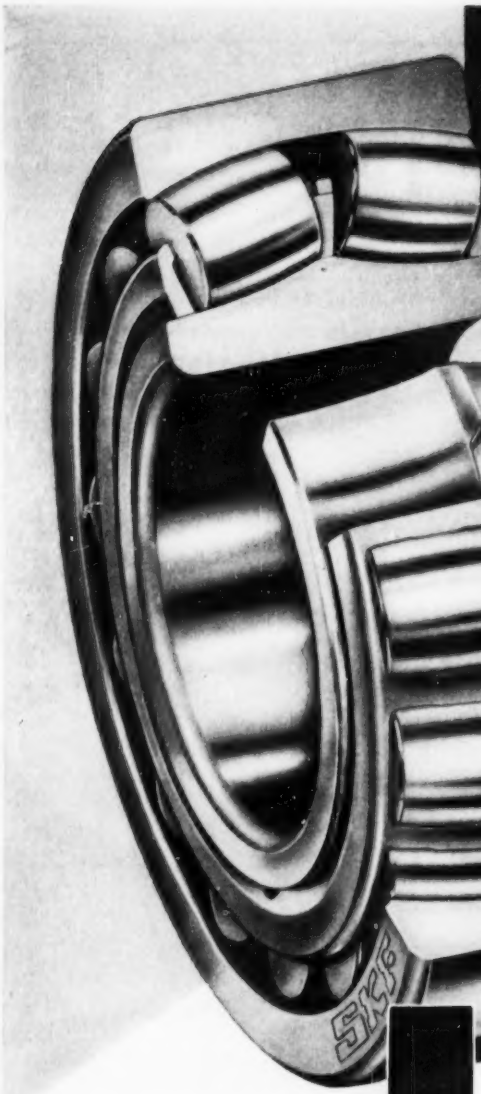

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increases the **service life 2 to 3½ times**

other advantages are important

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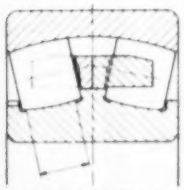
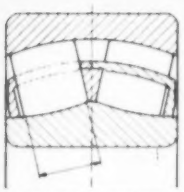
capacity

of spherical roller bearings 25% to 50% by means of improved internal design



BEARING 22315

This is the Spherical Roller Bearing design originated by SKF *more than 30 years ago.* The cross-section shows how the integral inner ring flanges, and the undercuts adjacent thereto, limit the effective length of the rollers.



BEARING 22315C

Here is the *latest* SKF improvement, a *revolutionary advance in design.* Effective roller guiding is accomplished by means of a separate ring. This eliminates the need for undercuts! This type of guide ring permits the rollers to take the position which their contact with the rings dictates. This assures uniform load distribution over the entire length of the longer rollers at all times. *Result*—greatly increased capacity and life.

SKF, the originator of the Spherical Roller Bearing, has, here again, provided Industry with another *first* through this improved design. During more than 4 years, thousands of installations have been made in railroad journals, vibrating screens, steel mill machinery and numerous other fields. Performance, in all cases, has been outstanding.

SKF Sales Engineers in our District Offices throughout the country will assist you in making use of the important advantages of the improved internal design of SKF Spherical Roller Bearings.

This 12-page booklet gives you additional facts—sizes available—added capacity, size by size—increased life you can expect for each size—dimensional tabulations—and load and speed data. Write for your free copy of Bulletin 365-1 *now.*

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ON THE
GOSS *and* DeLEEUW
Automatic Chucking Machine
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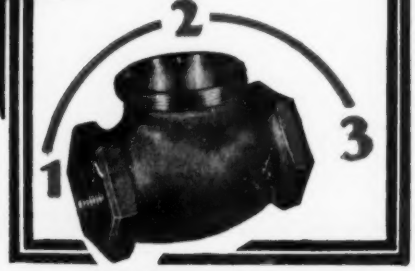
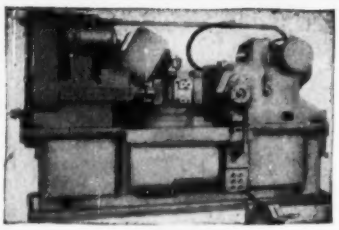


This recent Goss & DeLeeuw development has already received universal acclaim as an outstanding development.

In speed, ease of tooling and precision finishing, the "1-2-3" chucker provides engineering advantages which result in vastly greater production at a fraction of parts' costs by other methods.

Easy, fast change-over from job to job makes this machine ideal for short-run requirements. Sturdy construction, power and speed make its advantages apparent on long runs.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence — a method exclusive with Goss & DeLeeuw and offered on this machine.



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can be done either by the "author" or by the editors—the major job is to corral the necessary data and arrange it to convey the idea quickly and otherwise prepare it for publication—that's our job. What we pay contributors for, basically, is the idea and the quality of the drawings they supply. This perhaps explains why so few of our articles come from professional writers, who tend to write excellent essays on subjects that may have little interest to our specialized audience.

To sum it all up: We need, appreciate, and pay for ideas that will interest large reader groups. We don't worry too much about the form in which they are received—we've had them in letters, as manuscripts, as phone calls, and in personal interviews. One "manuscript" even included some handwritten, and some dictated (on cylinders) material, plus phone calls.

Whether we write the story—or you write it—is immaterial to us, if you *have* the story in the first place, and tell us about it. This is true of the section in *AM* you find most popular, "Practical Ideas," and to which every bit is contributed. Some of the contributions come in on old envelopes, some on butcher paper, and sketches are frequently very rough. That's all right—we have editors and artists, if you have the idea. And all of these items are eligible for the each-issue $25 award for the winner the reader vote.

That brings up our closing point. We send out a sampling survey on every issue. The votes of the group of readers who reply not only give us an evaluation of the particular issue, but an idea of what will be most useful in issues to come. Thus we can do the peculiar job of producing a brand-new product, tailored to your needs, every two weeks.—E J T

"Well, don't just stand there. How much did your wife demand you ask for this time."

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Availability – 14 sizes always in stock; bored or unbored hubs. 6" hub diameter joints or special machining to specifications.

Simplicity—fewer parts, simpler construction.

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ROUND TABLE *Discussion*

COFFEE BROKE

Does the coffee break tend to increase or break down shop morale? Should the tendency of some workers to take advantage of the allotted time warrant elimination of the practice entirely?

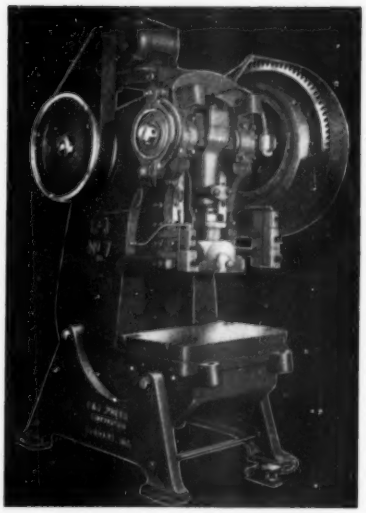
OUR PRESENT LIVING SCALE has reached a point where industry must realize that we are no longer the hardy individuals we used to be. No longer can the human race go from breakfast until lunch and then to dinner (it used to be called supper) without our super-modern coffee breaks.

Do they accomplish anything? Our experts who are selling the idea, and the coffee vendors say "Yes, it reduces fatigue; it makes the worker 'like' his company and want to work harder for it after his rest period."

Both of these groups are selling ideas, an idea to make money for themselves. Over the years this idea has grown into a multi-million dollar business; it is a new industry in itself—selling coffee to industrial workers.

In the old days before social reforms the worker labored from 7 a m to 12 without stopping. Many of these men lived to be 80 to 90 years of age. Today we start, perhaps at 7 but stop at 9 for a second cup of coffee—or perhaps it is our first breakfast. In the minds of many this coffee-break is the answer to an extra half-hour's sleep in the morning.

On the whole, people like to loaf, so we find the 10-minute break starts before the period and runs long after. It has been known that individuals have spent as much as ¼ to ½ hour getting ready for coffee and then an equal time in getting back to work. Why become excited over loss of time? Well, if we are supposed to work 8 hours per day with two 10-minute rest periods, then 7 hours and 40 minutes should be spent productively. But if we follow the routine of some workers we see that they get started on the actual work some 15 minutes after starting time, take another 15 to 20 minutes personal time before the coffee break and 30 minutes is consumed for the coffee. Then there is another 15-minute personal before lunch and a repeat performance in the afternoon. What does it add up to in productive hours —5 hours and 40 minutes—a far cry



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MORE PRODUCTIVITY AT LOWER COSTS

The accuracy and productivity of an L & J No. 7 Press plus the advantages of an L & J Fawick Air Clutch* give you an ideal combination for reducing costs and improving the quality of your press work.

This dependable combination permits maximum practical speeds plus greater safety and shock-free, full-power operation. Selective controls include inching, single stroke and continuous running. The L & J Air-Release Spring-Set Brake sets automatically if air pressure fails.

It will pay you to find out the advantages this 80 ton press has to offer. Also, 11 other back geared and plain flywheel models starting at 6 tons.

Write for literature.

*Trouble-free because of no end thrust, no springs, no keys and no shifting parts. Pneumatic clutch element on the flywheel constricts to grip the drum on the crankshaft flange.

L&J PRESS CORPORATION

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ELKHART, INDIANA

from 7 hours and 40 minutes we should expect for production.

Does the coffee break pay off? We have, perhaps, used too extreme an illustration. The rest period does have some merit when it is not abused, but it is not easy to keep it from being abused. Rest is needed on some operations and the coffee break can aid in relieving fatigue. Experiments show that when a worker really applies himself, the fatigue reduces his output and a break to relieve his fatigue serves to aid his productivity to jump back to where it was originally.

Control is the only answer to coffee periods. Foremen must see that workers properly follow the company policy, which must be clear-cut and definitely established. When workers are lax, then action must be taken to correct the condition before it becomes an out-of-hand situation. Control your workers, don't let them control you—a good motto for the foreman and the coffee break.

Charles D Townsend
West Hartford, Conn

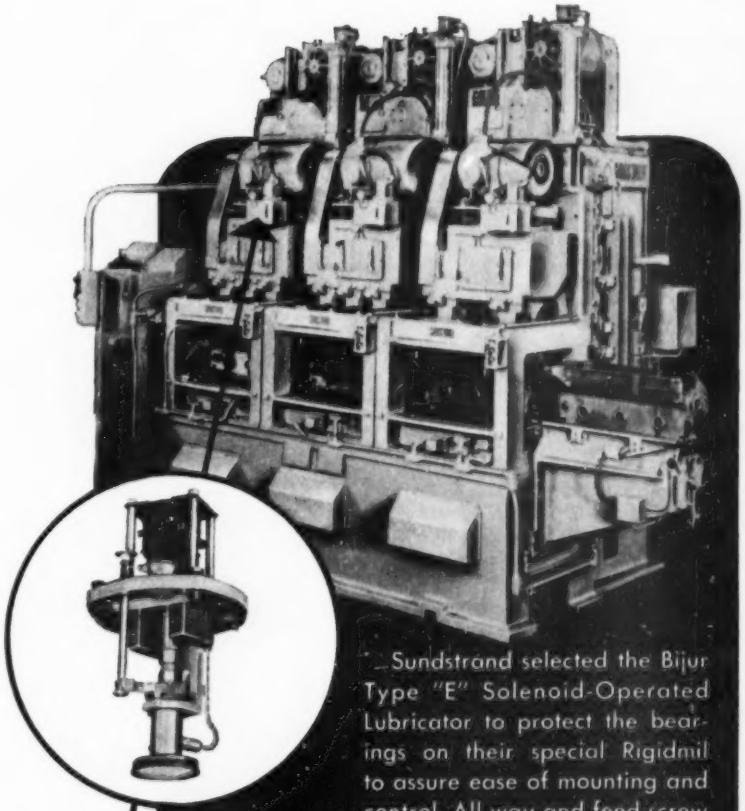
AL IS RIGHT in saying there is a lot of time wasted at the coffee break in shops.

The first time I came in contact with the morning time out was some fifty years ago when working for the United Shoe Machinery Co at their New York shop. At that time United Shoe did not sell its machines but assigned them on lease, and whenever a shoe plant needed new equipment a gang of workmen was sent out to put up the machines, shafting, etc.

The crews we had at the time were all Germans, most of whom could not speak English, and as I could speak the language quite well, I was assigned to one of the crews.

The first job we went to was in Brooklyn and I had six men. The superintendent went along with us and after giving me instructions concerning the work procedure, he handed me some money. "What's this for," I

VERSATILE *lubrication*



Sundstrand selected the Bijur Type "E" Solenoid-Operated Lubricator to protect the bearings on their special Rigidmil to assure ease of mounting and control. All way and feed screw bearings are ***properly lubricated with just the right amount of*** oil by lubricators cycled to the travel of the milling heads.

Bijur Type "E" Lubricators offer added ***versatility of application and positive control.*** They can be mounted anywhere on a machine since they operate without direct connection to moving parts.

Investigate the advantages of automatic lubrication for equipment you manufacture. Bijur's experienced engineers are qualified to aid you in designing lubrication systems for machines now in production or in the planning stage.

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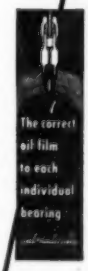

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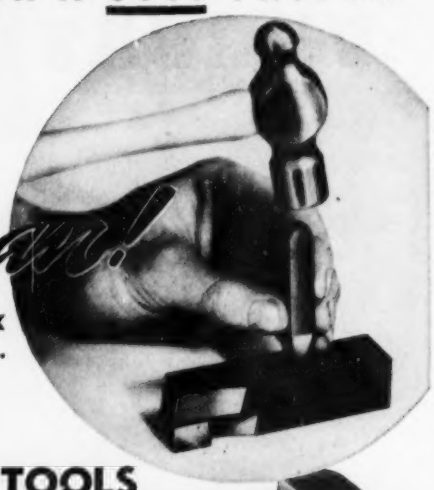

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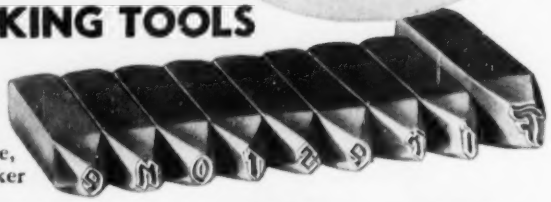

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by Parker

asked. He told me the men working on jobs outside the plant always had their sandwich and beer at about nine thirty a m. He told me where to take the men and instructed me to get them back to work in good season. He also told me the men would not work unless they had their beer and free lunch. This time out was not allowed in the company shop, however.

In the plant where I was superintendent for many years we inaugurated time out for lunch and the company had an outside caterer go through the plant once in the morning and again in the afternoon when the employees could buy food and drinks.

So much time was wasted in these rest periods that the company finally cut out the afternoon sessions, as they felt that the help didn't need the extra food after having a good noon lunch.

There are always some employees who see to it that they waste as much time as they can get away with —they must take extra time to wash up before eating, waste time reading while eating, and wash up again before going back to work.

Some of these employees take up to at least twenty to twenty-five minutes a day for this purpose, unless the foreman knowing who they are, puts a stop to their soldiering.

As for doing more work because of this concession, I am sure that most of the help do not make any endeavor to produce more, and if the truth were known, they do less.

The practice of taking a nip on company time and property should certainly be discouraged. Liquor at any time during working hours is an accident hazard.

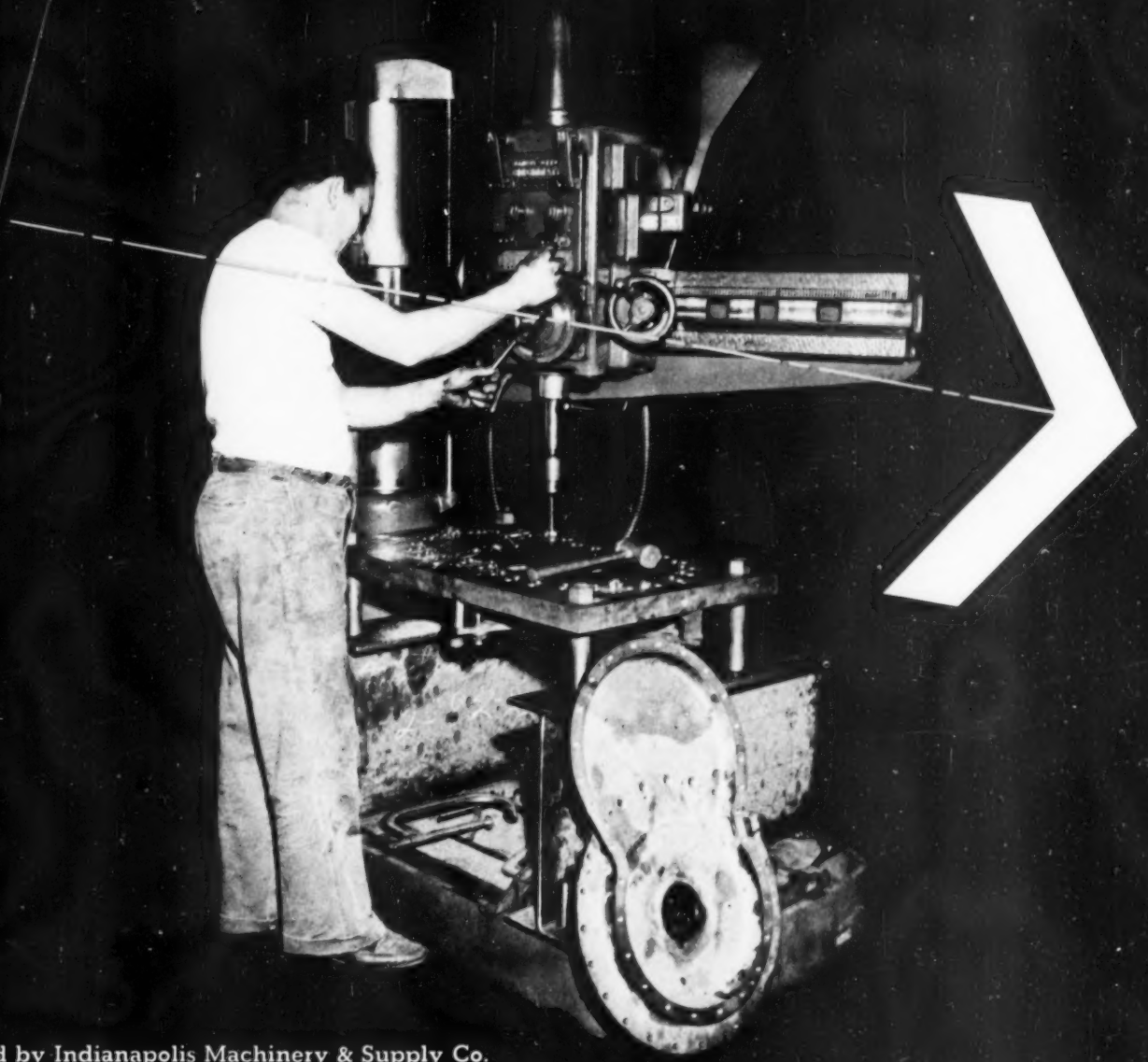
W C Betz

New Britain, Conn

ED IS QUITE right; in many places the so-called coffee break has become a loafing racket that serves no useful purpose and has got completely out of hand.

I can give you a couple of recent personal experiences as an example. I was in the design section of a well-known concern checking on some special work when I noticed one of the designers slip in through the side door, hurriedly hang up his hat and coat and rush to his desk where he pulled a lot of papers out of the drawer and scattered them over the desk top to show he was in the plant. He was a good half-hour late. After fixing his desk to look as though he had been working since starting time, he then walked back to his locker, got his hat and stepped into

BALANCED PERFORMANCE



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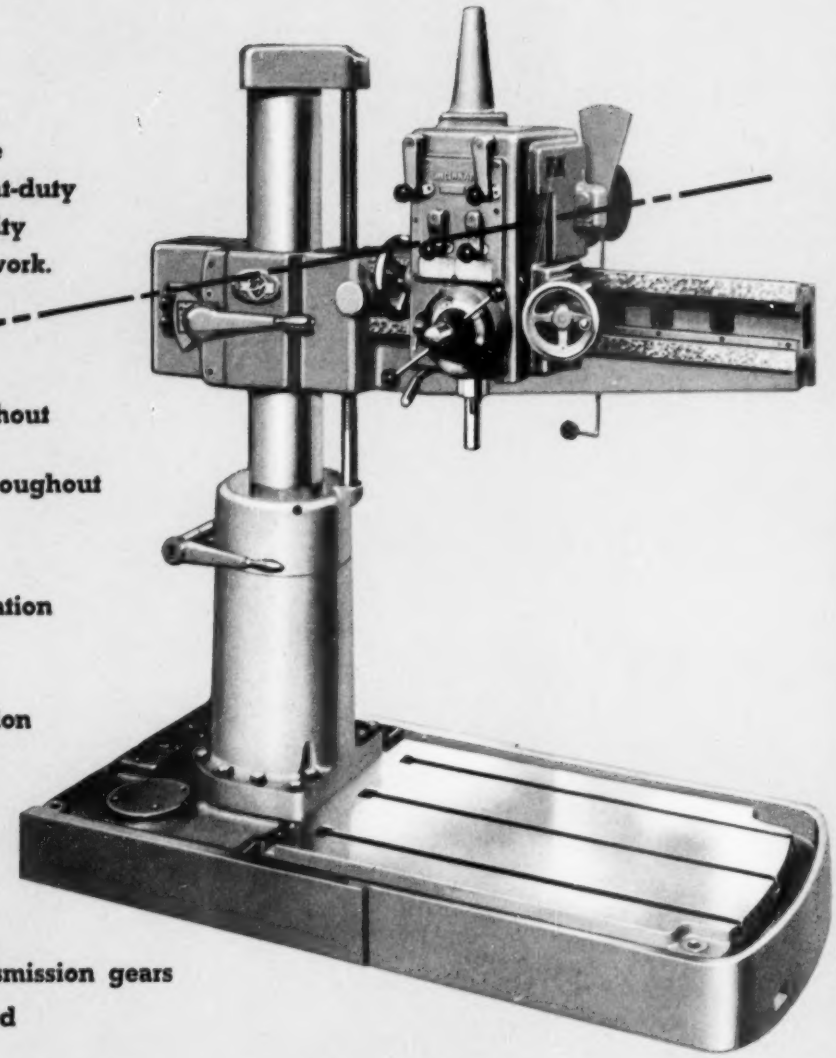

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in geometric progression
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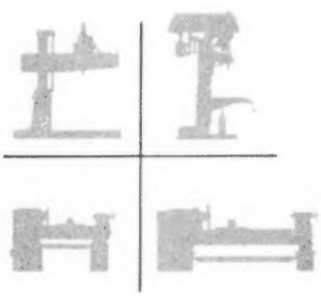

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the middle of the large office and loudly said, "Coffee—come on fellows." About half the office force quit work and went with him.

Another time, my car door-handle became loose, so I drove to the agency and the service man said he would have it fixed right away, if I would drive to the service shop about a block away. As soon as I arrived there, a mechanic came out and removed the inside panel and then said he would go to the storeroom for a replacement cotter and washer. He hurried off leaving me in the car; I thought he would be gone about a minute, for the items were stock parts at all garages.

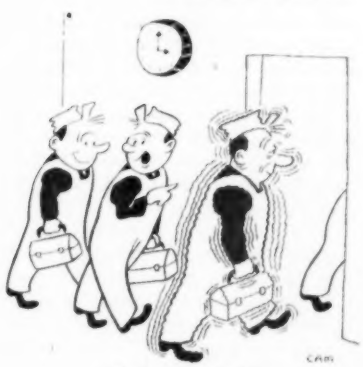
After waiting fifteen minutes I thought that something must have happened to the man, so I went into the shop to find out. I discovered him and about a dozen other mechanics standing around the heater drinking coffee and telling jokes. The cotter and washer mechanic saw me and called out, "Be with you in a jiffy; they're looking for the special cotter."

The service manager was standing nearby and I asked him what the party was about. He said it was ten o'clock and everyone quit work then for a coffee snack. I remarked that I guessed all the customers just had to wait for service at that time and walked out. Of course I have never been in that agency since and never intend to.

There seems to be no basic reason for a coffee break. If a man gets tired in the morning around 10 a m then either he is sick and should see a doctor, or he has been out most of the night and is in need of more sleep. There is a little more sense in the British tea at 4 p m for by then a man may need a little rest.

The final result of the coffee break seems to be that it gives another boost to the continuing spiral of the increase in the cost of living.

George P Pearce
Albuquerque, NM



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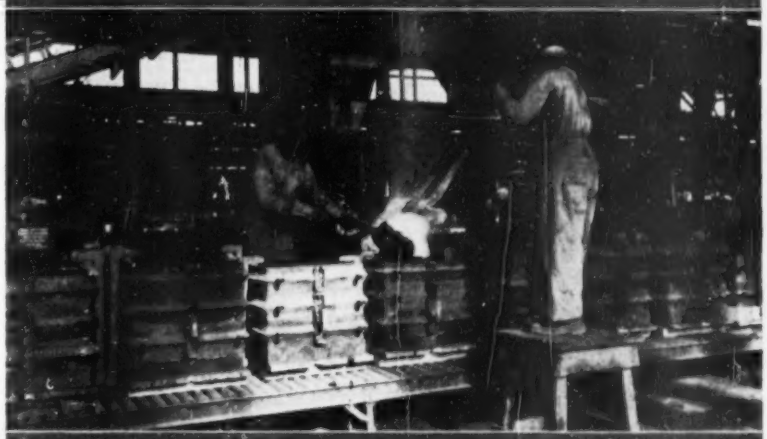

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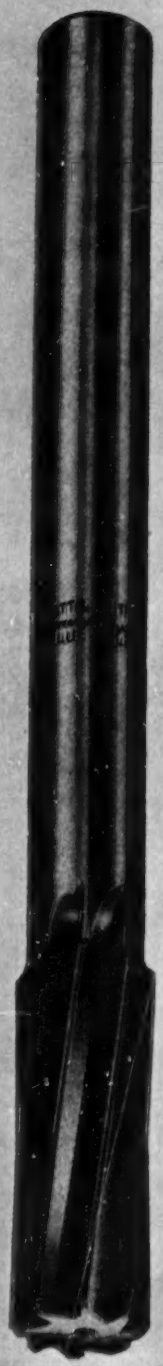

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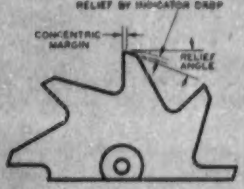

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SAFETY SNOOP

How should the problem of shop safety best be handled? Is a full-time safety engineer, with authority to specify changes, the answer, or will the workers operate better under a general safety program?

SAFETY IS EVERYBODY'S business, especially in a machine shop, yet there is a tendency to cut corners to the detriment of safety principles whenever a rush job comes along, even in a shop that carries the very latest in safety posters and slogans. Reminders are a valuable aid in making the shop personnel safety-conscious, but they are not enough. It is a sad but inescapable fact that we human beings must be protected against ourselves. We have only to look at the traffic lights on a busy street corner as an example of this.

Back of the traffic light reminder, of course, is the law and the traffic engineer who is constantly working to eliminate the blind corners and other safety hazards that beset the unwary and careless motorist. If an efficient traffic engineer can save one human life by careful planning, I think the average citizen will agree that his salary was money well spent.

So it is with the plant safety engineer. The average foreman and shopman is too apt to belittle the efforts of anyone whose productive ability cannot be measured on the shipping platform. The fact is, like Ed, we are all in favor of a general safety program but are so concerned with the day-to-day mechanics of production we don't have time for really constructive thinking on the subject.

By the same quirk of human nature that makes us inclined to be resentful of the traffic cop, the safety engineer becomes another "white collar guy" with a tendency to ask questions and upset the general routine. I remember an incident in one shop I happened to be visiting that sticks in my mind as a classic example of how some foremen regard the safety engineer. This foreman and I were talking together and the plant safety engineer happened to pass by with a cheery greeting. My friend looked after him with a rather sour expression and the remark, "That's one guy who knows where the soft jobs grow." I thought at the time that such an attitude could not promise much in the line of cooperation and yet at the same time I realize we are all inclined to the same negative approach.

If we look at the safety situation in an objective, unbiased light, there is much a good safety engineer can do to lighten the foreman's task.

With cooperation he can be depended upon to eliminate much of the lost time that accidents cause by removing the causes or conditions that contribute to them. By doing so he reduces the necessity of filing accident reports—always a disagreeable task for any foreman—as well as alleviating the need for investigation by the insurance company, and the damage to shop morale that follows accidents resulting in serious injury.

From the company standpoint also, the plant safety engineer is a good investment. Not only because of his training in the prevention of accidents to personnel, but because he has also been trained in the elimination of damage to property through his ability to detect fire hazards. In fact, anything that menaces the safety of a plant in regard to personnel or property is the particular province of the safety engineer.

So, while he may not be classed as a producer in the sense that he makes two gadgets grow where one grew before, he certainly cannot be labeled non-productive. Anything that contributes to the smooth running of a plant is bound to increase its value and the quality of its product, and a sound safety campaign backed by competent engineering will do just that.

Robert S Alexander
Greenville, RI

•

CRAZY NUMBERS

Are detailed cost reports of specific value to the busy foreman or will he tend to ignore them as a waste of his valuable production time? How can they be best presented?

THERE IS AN ANSWER to cost reports, or rather there are a million answers, all depending on the type of business under consideration, the kind of management, and the type of product being made. It is definitely true that proper cost information in the right hands is always productive of worthwhile results.

Now let us start with a premise: trucks should be used to haul bricks,

P&W TAPS
Always Concentric
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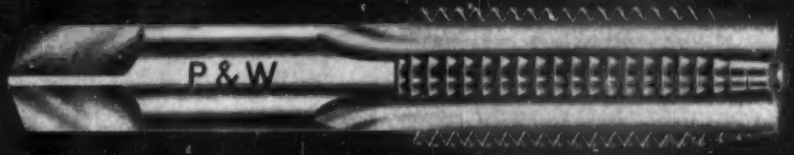

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SHANKS GROUND on CENTERS

Shanks are precision ground, on centers, as the first step in insuring concentricity between the chuck and the threads on the tap itself.

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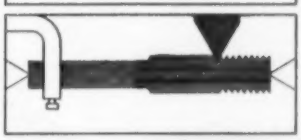

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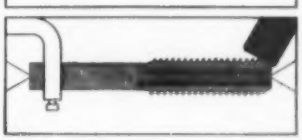

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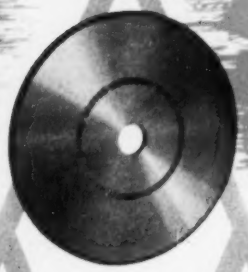

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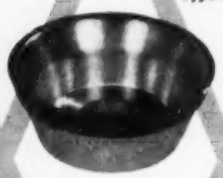

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Applied to shop practice, we mean that cost reports which go to a foreman should be reports that are suited to him, and not the type which are suited to a general manager.

The works manager is interested in depreciation, taxes, insurance, interest on various things, etc, but a foreman is not interested in these things, and couldn't do anything about them even if he were. Again, in many plants there is a decided objection on the part of management against giving such information and specific data such as the monetary cost of a part or a unit to shop employees.

By and large, there are sound reasons for this objection. When employees, for instance, find out that 11 cents worth of aluminum, 3 cents worth of tinned steel and 4 cents of direct labor becomes a saucepan which they find in their local stores priced at $.98 they immediately visualize tremendous profits. They are ignorant of such matters as taxes, variable overhead, shipping, merchandising, advertising and sales promotion costs, besides the underwriting of Arthur Godfrey who wishes Life to continue to be Beautiful. I've met many of these uncured cost figures coming back to me from a union business agent at contract negotiating time, and I sympathize with management in its desire for secrecy.

On the other hand, and getting down to business, there are costs that do, or should, interest foremen. I refer to controllable costs, like value of drills broken and replaced per month, cost of cutting oil, emery cloth, steel wool, cleaning solvent, files, hammer handles, wiping rags.

Then there are the costs of repair and maintenance services, trucking costs, cost of extra-curricular breakdowns and other expense items directly chargeable to a single department. It does no good to remind a foreman that his department is charged with the overhead expense of 2 1/3 watchmen, and that his department a'so is charged with a percent of the loss incurred by the plant cafeteria, as well as other charges he wouldn't understand, and couldn't do anything about anyway.

The best plan I have met is one in which every foreman is given a statement each month of his controllable costs, including all expense items under his direct control. In one plant I know of, every foreman is provided with a permanent departmental cost book. Once a month this book is removed from his office long enough to enter last month's costs and extend trend graphs. Then it is returned to him.

The figures in these books are simple, pertinent, and plain. In one month his broken drills' cost was $34; the next month it was $41, but the third month it jumped to $85. Why? That makes sense. One graph shows the relation of controllable expenses to direct labor. Another graph shows the relation of all maintenance cost to direct labor. A third graph shows the relation of departmental scrap to direct labor. Those figures and graphs are simple, easy to understand, but sometimes hard to explain. All of them concern figures and items directly under the control of the foreman, and are ones he can be called on to explain. And when the foreman knows that he is responsible for certain costs and is being checked on them, then you get action where you want it. And that is the only type of cost reports for foremen that are worth a grain of salt.

James K Matter
Detroit, Mich

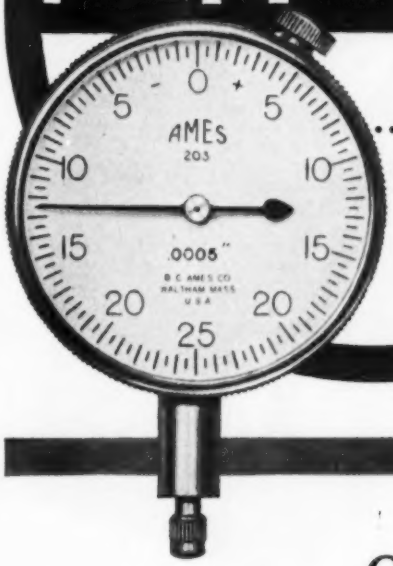
IS THERE AN ANSWER to cost reports? There certainly is and Al gives the answer in his opening sentence where he remarks "I spent half an hour of good production time trying to dope it out."

Time, production time, is the chief answer to cost reports so far as a foreman is concerned. There are others, of course, such as materials, tool breakage, use of unsuitable machines or methods, overtime, etc, all of which except perhaps materials, are part and parcel of a foreman's responsibility. Strictly speaking, materials should be ruled out, since specifying such will be the designer's or draftsman's job.

In some shops, however, if the matter is deemed to be not important, selection of some materials is left to the foreman's discretion. However convenient this practice may be, it is, in my opinion, no

"That's what I like about the old man—he always gives you a straightforward answer."

AMES



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part of a foreman's job. In a way, final costs do not concern a foreman. The amount of cover added by the front office can be quite unrelated to workmanship costs. Time spent on the job by his squad is the foreman's yardstick, his striking force; if that is sound, the prime costs will take care of themselves.

The experienced foreman on the shop floor will know how long a given job should take, and it is his responsibility to see that reasonable times are observed. If well done, this is a full-time job and will dispense with the unproductive occupation of poring over elaborate and often complex cost statements. The foreman who keeps an eagle eye on production times ranks with the doctor who prescribes preventive medicine, a much more sensible executive approach than sweating after a cure for a disorder which should never have arisen.

Ed's remark "There's a lot of good information in that report if you can dig it out," is illuminating. In an organized plant no production shop foreman should have to dig anything out, not even from shop drawings; his job is to get *work* out and nothing should be put in his way which is likely to hamper or annoy him in the discharge of that assignment. All paper work should be made crystal clear, "that he who runs may read," in order that the foreman may concentrate his skill and energy on achieving rapid and economical production. To pore over long, involved cost reports may be one way of keeping tab of costs, but it will not earn dividends for the company to have a *foreman* do the poring.

An experienced foreman who is constantly on the lookout for the short cuts, better and faster methods of production, is not likely to benefit much from lengthy cost reports; on the contrary, he will be anticipating them. "The price of peace is eternal

"Oh, yes, Joe's a machinist . . . he can fix anything . . . why, no . . . he won't mind . . . it won't be any trouble at all . . ."

Put YOUR Men in this Picture....

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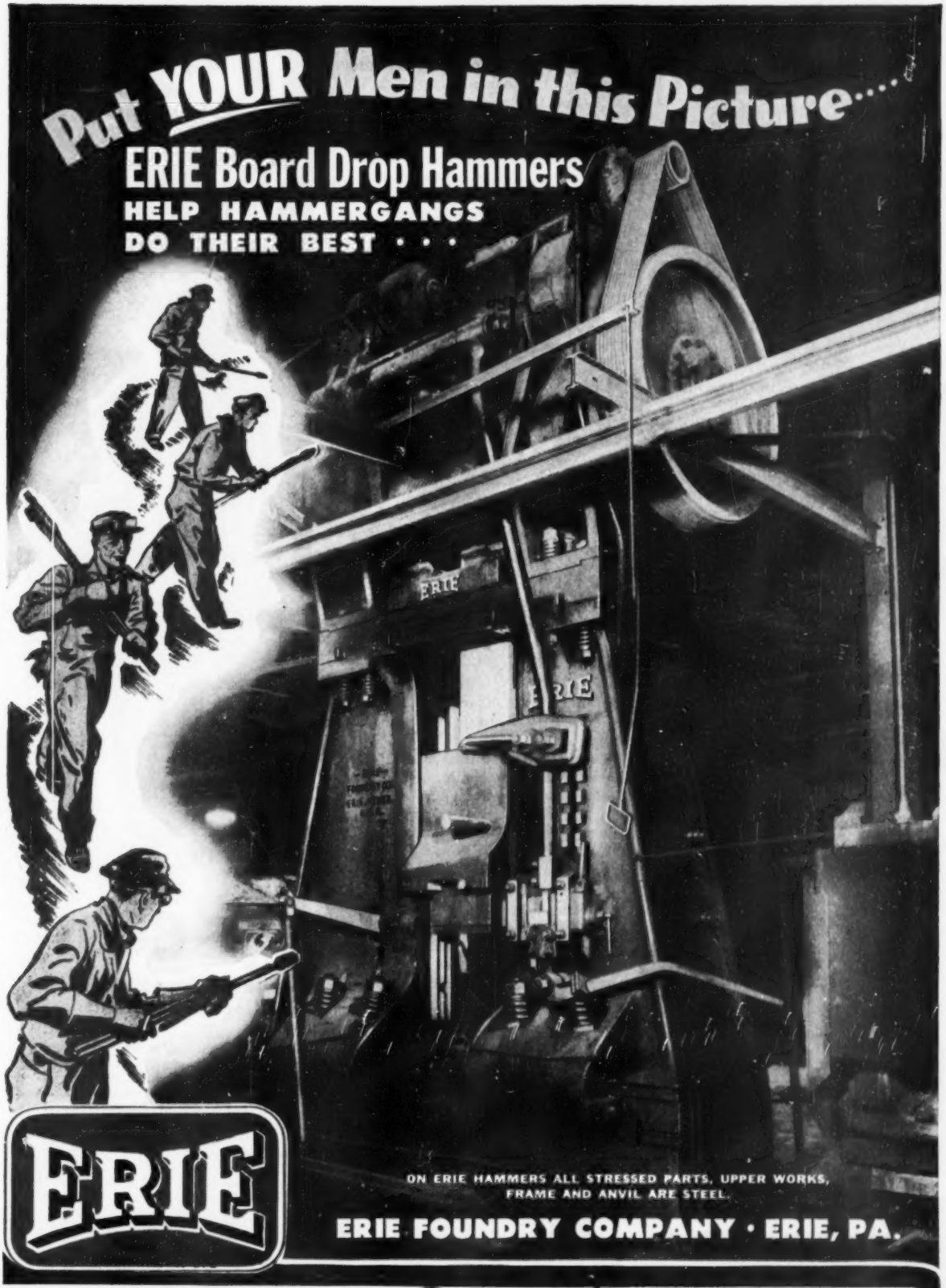

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vigilance"; if this is true of a nation's life it is no less true of a foreman's. If he is to have any peace of mind in his job he must always be on his toes. The foreman who knows his job and is vigilant in the matter of production times and in searching for new and better methods, has neither the time nor the need to spend on lengthy cost reports. If a given foreman happens to be indolent in such matters, a cost report might bring home to him the measure of his shortcomings, but I doubt if it would be instrumental in causing all such to mend their ways, even if they had a taste for reading dry matter.

The fatal weakness of a long, complex cost report which covers all foremen and through which they must diligently search and sift in order to learn if they are assets or liabilities to their company is, that if they are indolent and inefficient as producers, they are not likely to be anxious to read the statement; if they are not, they don't need to, so. in any case, the compiling and typing of a report designed to cover all foremen, good and bad, is a waste of time and money.

In any plant, it is a reasonable assumption that the production foremen in the red will be in the minority, otherwise the company employing them would have a short life. In the circumstances, it would be sufficient to notify the laggards, only.

Cost reports to those who earn them should be simple and detailed, their readers should be made to see at a glance where they have fallen down. Any overheads incurred by this simplification would be more than offset by notifying only the minority in the red and by the fact that the time of the majority would not be frittered away.

A simplified cost report *might* have a good effect on some of the laggards. It would soon become known

"Quick, Boswitz! Call off that incentive plan!"

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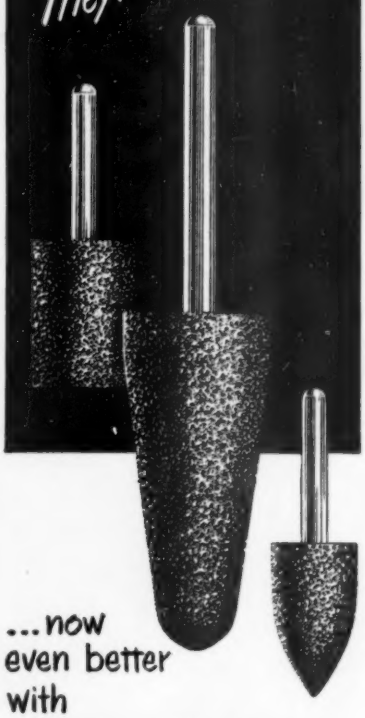

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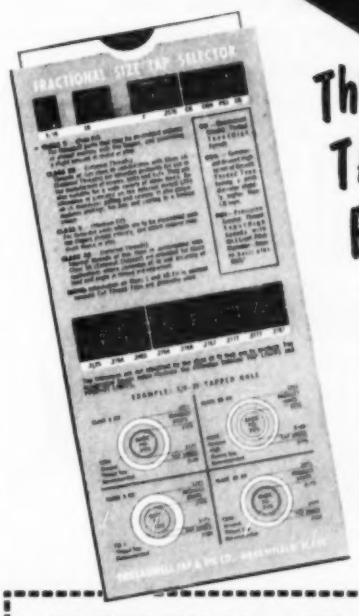
in the plant who were receiving the billet-doux and those who were merely lazy, but capable of improvement, might respond to the hint. There is, of course, only one successful way of dealing with the lazy and incapable, and, distasteful though it be to most managements, the proven inefficient must make way for others.

A shop foreman can keep up with cost reports by keeping abreast of the times and by being master of his job, by using every weapon in his armory to increase and lower the cost of production. First and foremost, he should set a high example to his men. Example is always better than precept and even the shellbacks are compelled to take notice of it. A smartly-dressed foreman with an alert and businesslike manner makes an incalculable impression on the men, and to gain their confidence and respect is the first step. Punctuality in the boss results in good timekeeping by the men and good timekeeping reflects favorably on costs. Tidy, well-ordered shops add their quota to production results, and the foreman who sets a good example in the matter of tidiness will make keeping up with cost reports easier for himself. By foresight and careful personal attention, machine downtime can be kept at a minimum. Tool breakage can be a prolific cause of high manufacturing costs on certain products and the alert, experienced shop foreman will find much scope for cost reduction in that field. Overtime should never be worked except on instructions from above.

If these suggested ideas are properly handled and some system of payment by results is operated, cost reports should have no terrors for the foreman capable of introducing such measures, and of supervising their operation. There should be only one interpretation of cost reports, if properly drafted.

M Donald
Lanarkshire, Scotland

"If you didn't deduct for pensions, welfare funds and sick benefits, I wouldn't need a pension, a welfare fund or a sick benefit."



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TOOL COLUMBIA STEELS

SALARY NO SECRET

Should a man's earnings be his private business? Will public knowledge of each worker's wages quiet curiosity or tend to arouse resentment among the men? Some readers say . . .

I DON'T BELIEVE a man's pay should be exposed to everybody else; this won't stop snooping and prying into other men's financial affairs but, instead, increase gossip and all sorts of talk. It will certainly stir up a hornet's nest.

I don't think either that it'll act as an incentive for a fellow to do a better job. On the contrary, a fellow rated low is very likely to leave if his rate is exposed to others. And the high-rated guy will be annoyed by all the jealousy that surely will develop among the rest of the crew. It's very true, as Ed suggests, that any man cherishes a little secret like the money he is making. It is really his own business, and not his fellow worker's.

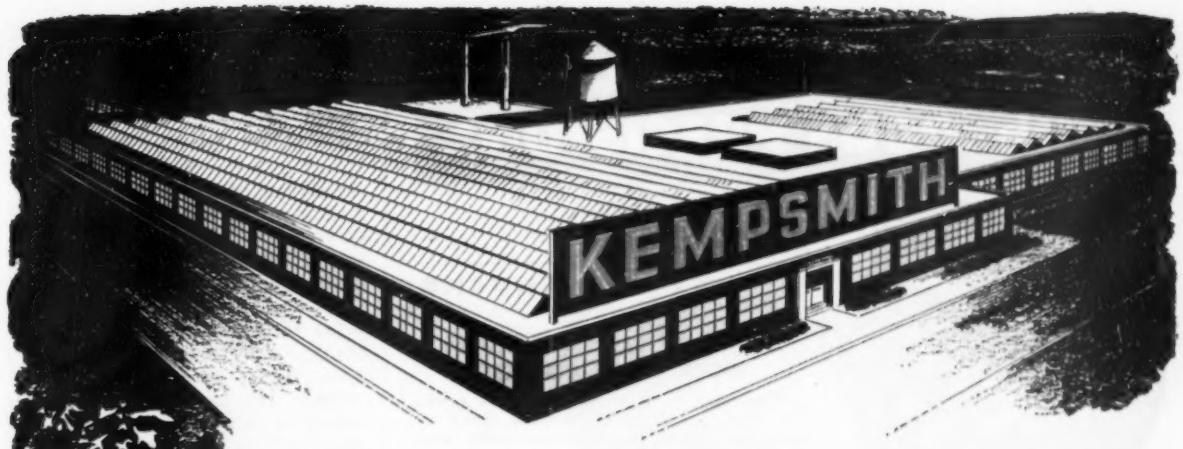
Any man knows there might be others who make more money than himself and he knows, too, that if he is clever enough and industrious, his own pay will be raised. This need not be posted on the bulletin board. In fact, posting any private things on the bulletin board is annoying to all concerned.

Al is wrong when he says putting the rates down in black and white will stop a lot of guessing and wasted time snooping into other people's business. I don't think such activities are carried on to an extent anywhere near the point he seems to suggest. I have been working in machine shops for decades both in the US and in Europe, but I have never experienced much time being wasted for this reason. If anybody is worrying about my own or other fellow's wages, he might as well be left worrying; he gains nothing by it.

Let the man who is worrying about other people's pay sweat it out with himself, pull himself together, and work hard to get a better wage rate or a better job.

A E Fristedt
Stockholm-Bromma, Sweden

THERE ARE many different systems of rating the employee. In the toolroom or machine shop there is 1st, 2nd, & 3rd class. In some grinding departments they have assistant grinder, grinder or master grinder. In the production departments there are all sorts of classifications such as learner, trainee, helper, and operator. There are many other fancy names they use to classify the employee.



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Kempsmith Type "G" Plain Miller. All geared for positive power and smooth cutting, free from chatter. Note rugged, streamlined appearance. All controls are grouped within easy reach of the operator. Available in No. 1, 2 and 3 sizes, plain and universal models.

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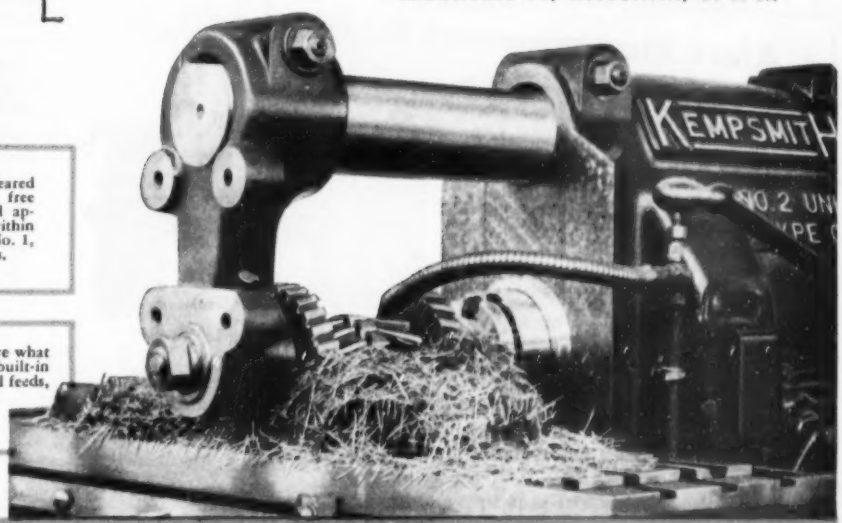

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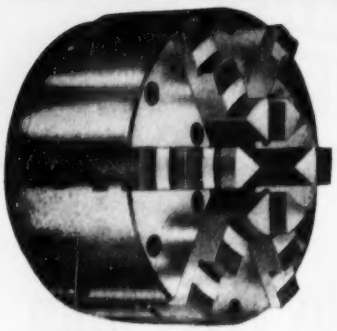

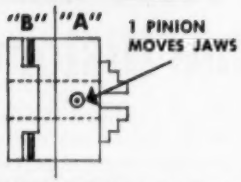

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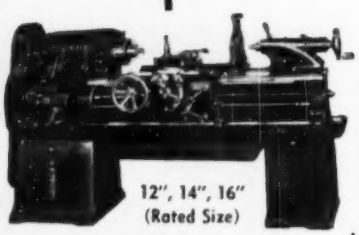

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Some plants classify the employee according to ability shown; others cannot reach the top classification until they have built up a period of service. Everyone knows what the other fellow makes by his classification. This is fine as it goes, but there are always those fellows who are outstanding. I am speaking of the kind of man who is an eager beaver, always looking for a better way to do the job. He is cost conscious and turns in good suggestions. He takes pride in the job, is fast and accurate. He is one of those fellows who is so enterprising he just won't be stopped. This kind of employee keeps others on their toes. He is a valuable man to have around. Such an employee certainly should be rewarded and not stuck with a classification. Yet if he is raised above the top classification all the other employees are up in arms. I don't think this man should be held down, and I don't think he should have a price tag attached for a higher rating. If we hold this kind of man to the classification rated tops for the operation we may lose him. We can and should pay according to ability in a case such as this.

A E Salmons
Philadelphia, Pa

WE DOUBT WHETHER anyone likes to have his salary or hourly rate made public in a list of compensations to individuals. And as for the other person's wages, there is a little bit of larceny in the heart of all of us, as the saying goes, so how can we keep our feelings neutral, without envy or resentment, if we see someone else being paid more than us, and doubt that he earned it? But I never met anyone who was so foolish as to complain about someone else's wages. He'd soon be told off. If dissatisfied, one has to try to better oneself by better work and more output.

"You get the idea now?"

In these times of union contracts, while lists of individual workers and their compensation are not made public, their wage rates are known, usually to the union having a contract with a given industrial firm. When an individual employee gets a raise, both he and the union are notified. If anyone wants to know how his wages compare with his fellow-worker's, he can see the union shop steward, who'll set him straight, quickly. The jobs are rated, and graded. These job rates, as most people know, were supposed to make wage rates to employees fair and equal, to stop guessing and uncertainty, to do away with favoritism and to minimize the aggressiveness of some who are more capable of arguing for their rights.

These job rates are all right in that they are not secretive, but I think there is some tendency to limit or cut down initiative when an employee knows how high in a labor grade he can go, though not seriously, since the top labor rates (wages or salary) are high enough to be difficult of attainment.

Thus, in conclusion, I feel that under present industrial conditions, salary, or wage rates, cannot be kept under cover due to pressure of labor groups, and, while job rates are open to inspection by these labor groups, this setup will continue to be tolerated and accepted.

Edward Diskavich
Torrington, Conn

•

INDIAN GIVER

Should a foreman have the authority to arrange occasional special vacation schedules for the men under him, or is this the prerogative of the personnel department? Does the foreman or the front office know better as to when the work load will allow special treatment?

I THINK IT HAS BEEN established that a foreman is a direct representative of management. As such, he is not only concerned with the welfare of the company as a whole, but primarily his first duty is to keep his department up to peak efficiency as a unit. In order to do this he is responsible for the men in his department and also responsible to the men. That is to say his men must have confidence that if he makes a statement or promise, his own integrity as well as the company's will see that whatever is promised will be carried out to the letter.

In the case under discussion, our friend Ed could not have known about the ruling governing unusual vacation periods, otherwise he would

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THE RUTHMAN MACHINERY CO.
1818 Reading Road, Cincinnati, Ohio

have consulted the personnel department before making the promise. Naturally, when the promise he made backfired he had every right to be sore. You cannot hold the respect of any group of men if they cannot trust you to make good on a promise, no matter how well-intentioned you may be.

Nor can you expect them to have much faith in a company that refuses to back a foreman in a simple matter such as this. As I see it, the big boss was wrong in making Ed lose face with the men whether there was a clear-cut company policy on the matter or not. If Ed had gone against company policy Mr Big could have given him a bawling out with justification, coupled with a warning to see that it didn't happen again, but it would have been better from an employee-relations standpoint to let Ed's promise stand, and give the men their vacation so long as their absence didn't affect production. At the next foremen's meeting the big boy could have explained his exception to the ruling and everyone would have been satisfied.

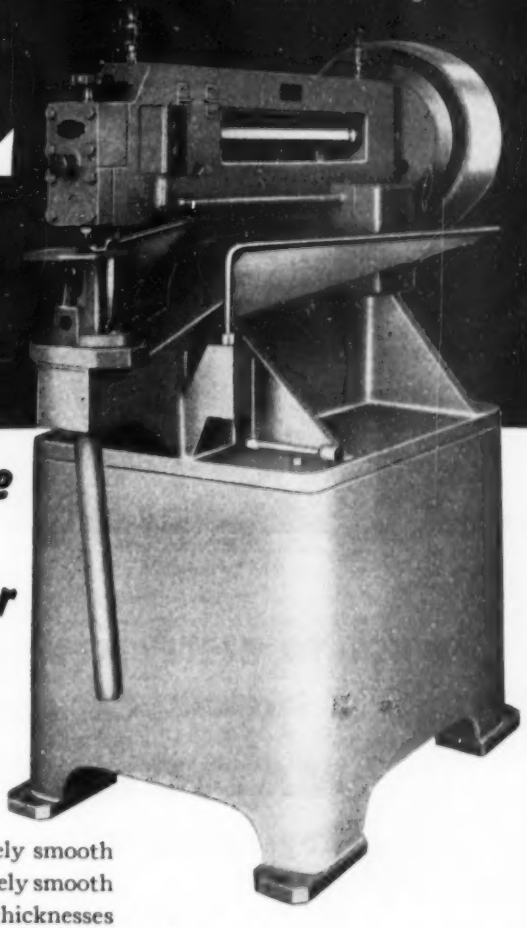
Regimentation is not a pleasant word in a democracy, and any company that goes in for regimentation and red tape is not a pleasant place to work. If a foreman's sense of responsibility has to be hedged about by all sorts of rules and regulations that interfere with a free exercise of executive ability, sooner or later the company is bound to suffer.

There is a story told about the great inventor, Thomas Edison, that may have a bearing on this. It seems Edison hired a young chemist, not long over from his native Germany, in connection with some experiments he was conducting in improving the quality of the wax for the early phonograph records. After the inventor had explained to the young man what he wanted, he started to make a bee-line for his favorite arm-

"Hmmm—now where's a good spot to hide this important letter so my secretary won't file it."

ACCO products

CAMPBELL Nibbling Machines



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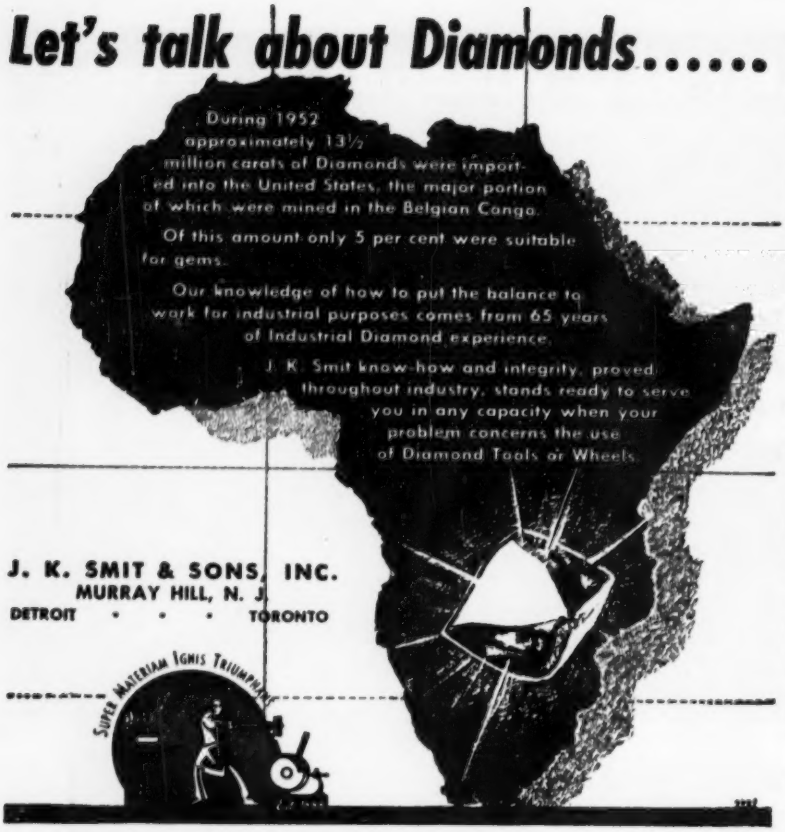
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chair. The young fellow followed him and inquired in halting English if there were no rules and regulations to be observed while he was in the laboratory. The old man looked at him quizzically over his glasses. "Rules? Regulations? We don't have any here. All we are interested in is results."

I think the moral is clear. A good foreman, like a good mechanic, can be trusted to produce results with the minimum of supervision.

Robert S Alexander
Greenville, RI

EVERY COMPANY SHOULD have a policy regarding vacations. These policies should be put down on paper so that all may understand them. Vacation period should be clearly understood by the employees and the foremen. This includes the date and months, vacation starts and ends.

One of the hardest things we have to do is to get the employees to follow a policy that is not written down. Once they are made clear, they are established, and we cannot deviate from them or we have no policy.

The front office is certainly in a better position to know its commitments than the foreman. The foreman should check with the front office on any unusual vacation requests. There are less headaches in the day's work when everyone knows all the rules. There is no one thing that causes more resentment than to grant a man's vacation and then change it.

Many firms have policies that are not clear to the employees. This is just as bad as no policy at all, and the company is always in hot water. It is such conditions that cause contention between staff and line. A good, sound policy takes the grief out of grievances.

A E Salmons
Philadelphia, Pa

I DON'T SEE what harm there is in a man asking for a few days off at an appropriate time if he makes it up out of his vacation period. If it were a half-dozen or more asking for time off to go hunting or fishing, then it is plain that this would be an effective way of throwing a monkey wrench into the machinery of production. In such an event there is no doubt of the big-shot's reaction and he certainly would be justified in bearing down as he did.

However, when one or two of the fellows take it into their heads to exercise a little gunpowder sport and the foreman acquiesces, I cannot see where the higher-up is justified

in butting into something that is strictly the foreman's business. Some men are naturally dictatorial; they have an innate propensity for wanting to have everything to say about what goes on. If the facts were known, this chap, who is so bent on depriving others of a little bit of pleasure, will suddenly shove the papers to one side on his desk—or else hide them in a convenient drawer—and then hightail it to the golf club with several other big shots who delight in satisfying their own desires, yet look with great disdain upon anybody else who wishes to live his own life.

No one but an egotistical jackass would diminish the valuable prestige of one of his supervisors by showing him up before his men, as in the case of Tom Jones and Dick Hartley. If a foreman sees fit to make a promise to one of his men, he's doing it with the knowledge of situations in his department and should be upheld by the superintendent. The superintendent should back up his foreman whether he likes it or not, and fight diligently for the man's honor and standing among his men.

Jack Everett
San Francisco, Calif

THE SHOP FOREMAN knows when he can best spare men for their vacation because he is held responsible for output, and if he is a good foreman he has scheduled the work for many weeks ahead, got material ordered for definite arrival dates, his men lined up, and his machine work scheduled to beat the deadline on the various jobs in the file.

If after all this planning the personnel manager has the authority to go ahead and schedule the vacations without consulting the foremen, then the factory is going to get into utter confusion, but I doubt that any responsible manager would ever permit such an arrangement as this.

"The printing press broke down so personnel asked me to run off this week's Shop Bulletin for them."

Boye & Emmes standard headstock, with cover removed, showing constant mesh, wide face gears and large diameter, positive jaw, sliding clutches.

THE LATHE CAME BACK*
-After 25 Years-

HEADSTOCK GEARING
"GOOD AS NEW"

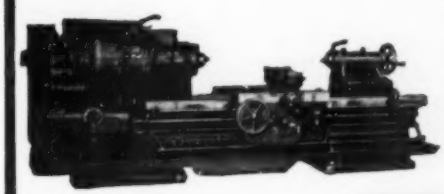
Boye & Emmes Engine Lathe No. 300-141, owned by The Timken Roller Bearing Company, Canton, Ohio, was returned for factory inspection after twenty-five years of day-in-day-out use. During this period, Timken purchased repair parts from us, for this machine, to the extent of $154.15. Yet, when the headstock cover was removed at the factory the gearing was found to be "as good as new." This is usual.

CONSTANT MESH GEARS
POSITIVE JAW SLIDING CLUTCHES
SPELL OUT THE ANSWER

The principle of power transmission which is used in Boye & Emmes Engine Lathes incorporates constant mesh headstock gearing, with speed changes effected through positive jaw, sliding clutches. This construction eliminates gear wear due to shifting action, allows shorter shafts, less space between bearings, and hence more accurate and rigid construction.

FREE LITERATURE

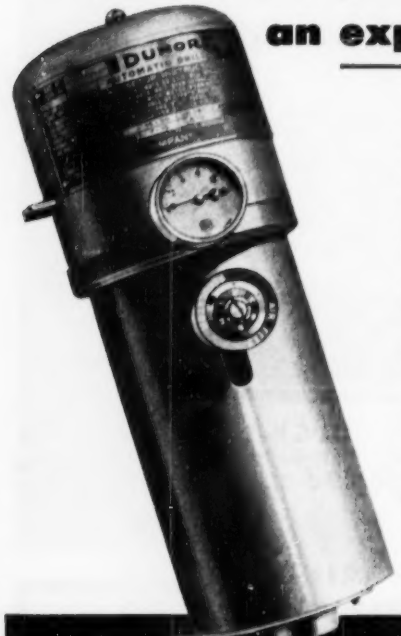
If you are not now using Boye & Emmes Long Life Engine Lathes, investigate. Compare this lathe of low maintenance and high accuracy from every viewpoint. Specifications and details of construction for all sizes are contained in our free Bulletin No. 601. Write for it today!



*One of many documented cases of "no wear" in Boye & Emmes constant mesh lathe headstock, after years of use.

LONG LIFE LATHES
BOYE & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO

NOW, DUMORE DRILL HEAD
makes every drill operator an expert!



THE new Dumore Automatic Drill Head does away with operator guesswork — the new *resistance drilling* way. *High drill breakage losses are virtually eliminated by this remarkable new tool.* It produces premium quality, small diameter deep holes, even with unskilled labor. And shop foremen report average drill life increases as much as 93 per cent.

Dumore's new *resistance drilling* automatically equalizes the *exact* pressure required for every stroke of the drill head . . . automatically compensates for variations in drill quality and workpiece hardness . . . factors your drill operators can't compensate for by sense of touch alone.

Depend on Dumore Automatic Drill Heads — *and get big savings in drill costs,* quality workmanship plus production increases.

Get all of the advantages of this remarkable shop tool. Ask your nearby industrial distributor for a demonstration, or write the Dumore Company.

Holes for airplane parts are produced 12 times faster at a 97% cost reduction with this setup. In fact, the Dumore Drill Head paid for itself after only 4½ hours operation.

DUMORE PRECISION TOOLS

The Dumore Company

1319 Seventeenth Street • Racine, Wisconsin

On the other hand, no foreman should be allowed to arrange vacations for his men just to suit his own fancy. He should coordinate his vacation schedule with the personnel section so the various departments can continue to function efficiently. When men are on vacation their output is zero and the department they feed will have less work coming in; to even up, the first department must either deliver from an accumulation of stock parts, or the second department must arrange for some of its men to go on their vacations at the same time to thus even up. All these interlocking actions should be properly scheduled by the personnel department; for this reason, as well as others, personnel should be consulted and have the power of decision on the vacation.

Personnel should have the overall picture of production, whereas the shop foreman knows only his department and its capacity. He can not be expected to know the interlocking and dovetailing of all the departments to provide a smooth flow of production. The foreman should not feel sore because the personnel department insists on keeping tab on who is to have his vacation when.

The arrangement for vacations is a serious business and needs a lot of common sense. Joe may work in the machine shop, Sally, his wife, may work in the accounting department, and Jerry, their son who is going to college, may work during summer vacation in the foundry. It is obvious that the vacation schedule should be so arranged that this family can all go away together and this is where the personnel department can do so much toward maintaining a loyal and happy organization without which the entire plant may start on the downgrade.

"It looks like sabotage to me."

"We make sure that

there is **NO RUST** *on these expensive dies*

—we use **GULF NO-RUST**

Application of Gulf No-Rust C (polar type) to three-stage 22-station progressive die, which lances, forms ears, pierces, and forms anchors on automobile parts in one stroke of the press.

"We can't take a chance on rust spoiling the surfaces of expensive dies like these, which cost in the neighborhood of $20,000," says Mr. Folland. "That's why we spray them with Gulf No-Rust C. It not only gives good protection but also displaces any moisture which may already be present on the surface of the dies."

For additional information on Gulf No-Rust C (polar type) or on any of the complete line of quality Gulf rust preventives, send the coupon below.

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Gulf Oil Corporation · Gulf Refining Company AM
1934 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of your pamphlet, "Gulf Rust Preventives."

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Company .....

Title .....

Address .....

FORMING FACTS

72% SAVING IN METAL!
80% INCREASE IN PRODUCTION!
UNIQUE BALANCE CO. INC.

Typical results by every user of NILSON 4-SLIDE Wire and Ribbon Metal FORMING MACHINES

Plants from coast-to-coast are setting new production records with NILSON 4-SLIDE MACHINES . . . and experiencing tremendous economies and greatly improved quality.

Are you confronted with a keen competitive situation? Take the advice of hundreds of plant supervisors . . . install NILSON MACHINES and enjoy these economies *at once.*

NILSON combination press and 4-SLIDE forming machines take the stock directly from the coil — feed, straighten, pierce, blank, swage, stamp, coin — perform up to 5 forming operations and cut off . . . all in one quick, precise operation AUTOMATICALLY!

USING A NILSON COMBINATION PRESS AND 4-SLIDE FORMING MACHINE

Unique Balance Co., Inc. (one of the largest manufacturers of sash balance equipment), now produces 71,532 more parts out of the same amount of steel, compared to their former method. Production speeds increased from 100 to 180 pieces per minute.

There's Nothing Like a NILSON

For specific recommendations, send prints or samples of your operation when requesting bulletin.

THE A. H. NILSON MACHINE CO.
1519 RAILROAD AVE. BRIDGEPORT, CONN.

Automatic Chain Making Machines • Automatic Staple Forming Machines • Wire and Stock Reels • Foot Presses • Wire Straightening Equipment • Slide Feeds for Presses

The foreman should prepare a tentative vacation schedule based on his knowledge of his organization and turn it in to personnel for their review and suggestions; then the schedule should be worked on until all concerned are as near satisfied as is possible, but personnel should have the power of final decision.

George P Pearce
Albuquerque, NM

IT HAPPENS that I have never met up with a situation where the personnel department has the last word on granting vacations at unusual times. As a matter of fact, I wouldn't even know just what is considered an unusual vacation time. In my book there are no unusual vacation times. I certainly wouldn't call the hunting season or the fishing season unusual vacation times, but even if they were so considered, I'd resent it mightily if a personnel department over-ruled me in a case such as Ed faces. If such an act represents increased regimentation, then we can very well do without it.

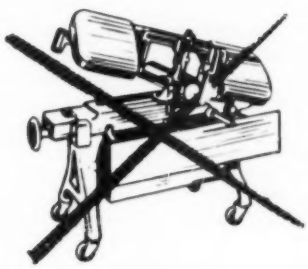
A foreman or supervisor has a tough job getting work out of men. All day long he is more or less on the muscle; he has to be, for that is his job. It is his responsibility to meet production or work schedules, and in order to do that he has to maintain the morale of his department.

One of the best ways of maintaining morale is for the supervisor to genuinely interest himself in those personal affairs of his men that are told freely. This familiarity brings extracurricular requests for time off, and as many of these requests are in the strictly legitimate class, they must be given fair consideration. Now most foremen do have the authority to cut a piece of cake occasionally—that is to grant a deserving man the right to take time off for special occasions. Foremen are particularly glad to grant this permis-

"Your husband will be late for dinner . . . He overslept."

Model 8CW Coolant equipment shown is available at extra cost.

AN ALL-NEW DESIGN . . .



Model 8C's smooth, clean-cut design eliminates the multitude of clothes-catching, dirt-catching and knuckle-barking projections common to conventional metal cutting band saws.

FIRST TO MEET TODAY'S METAL CUTTING NEEDS!

You'll get performance never before available when you get the ALL-NEW Model 8C band saw. Designed to meet your metal cutting needs today—and for *a long time* to come—Model 8C embodies years of *Kalamazoo* experience in the field and the best industrial design talent.

Once you've *seen* the new 8C, you'll agree it has everything you've been looking for in an 8-inch metal cutting band saw. Ask your dealer for a demonstration *soon*—or write today for descriptive literature and the name of your nearest dealer.

MACHINE TOOL DIV. *Kalamazoo* TANK and SILO CO.

935 HARRISON STREET • KALAMAZOO, MICHIGAN

MEMO
TO J.B.S. Plant Supt.
Let's check the Ransburg spray painting processes to see what they can do for our paint line... Their story sure sounds good.
E.

Yes, the Ransburg story of cutting painting costs to a fraction of the cost of other methods does sound good. It *is* good!

On most factory production lines, the Ransburg electro-coating processes will provide 2 to 4 times more parts per gallon of paint—automatically—with one operator doing the work of many.

That's because the Ransburg No. 2 Process is the most efficient spray coating process ever developed for industry's use.

If you are a manufacturer of painted products, and if your work volume warrants conveyorized painting, we'd like to tell you more about the production efficiency of the RANSBURG No. 2 PROCESS as it applies to YOUR production. Too, we'd like to show you typical examples of customers' production lines where the Ransburg No. 2 Process is setting new quality standards . . . increasing production . . . and at the same time, saving manpower, money and materials.

Write for literature, or send for "Miracles In Painting" —our new 16mm. sound and color movie which shows on-the-job examples of Ransburg Processes at work in industrial plants all over the nation.

RANSBURG

Ransburg ELECTRO-COATING CORP.

INDIANAPOLIS 7, INDIANA

sion to the deserving; it helps their own prestige to do so. Take this privilege away from them and you've taken one of their most effective tools.

James K Matter
Detroit, Mich

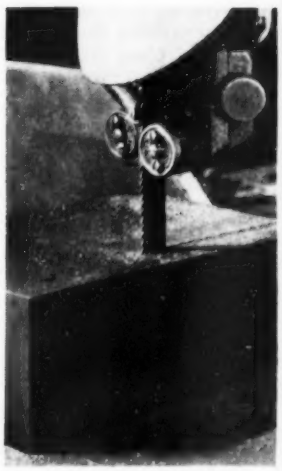
JUST WHERE TO DRAW the line between immediate and front office supervision is often a ticklish question, but here we have a clear-cut case of front-office interference in a strictly local question. Never has regimentation of this type had good results. When a man is made foreman he has certain responsibilities—and certain rights. It is his job to supervise, and every man has his own way. If the foreman and his workers do the job, management has no right to interfere with legitimate efforts to improve the relationship with the men he is responsible for.

There are several concrete advantages of having the foreman handle questions of this type rather than any higher authority. First there is a personal advantage. Letting the foreman handle leaves gets away from the impersonality of most businesses. A favor like this from the foreman promotes the spirit of cooperation that has been shown time and again to be of tangible and intangible benefit to any concern. Secondly there is an administrative advantage. It is simplest to let the foreman handle it. Any other system is going to cost money to keep it going. It is going to make more red tape for the worker to crawl through with no compensating advantages for the extra difficulty. Thirdly there is a morale advantage. The worker won't like it because, instead of a matter of a moment or two, it is now a consideration of some difficulty and annoyance. The foreman won't like it because he loses a chance to do a favor and also because of the implied distrust. Whoever does handle it won't like it because it means more headaches of a non-essential nature—something to keep him away from important work.

The basic question here is one of

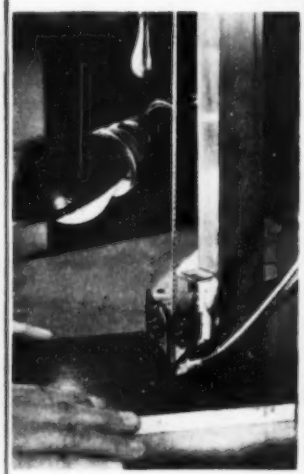
"Pss-st!"

Pick the Top "NAME BAND" for all these Metal-Sawing Jobs



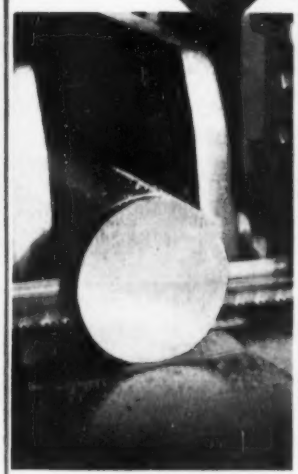
For Heavy Production Cutting

You'll like this rugged, break-resistant standard tooth blade for trimming gates and risers off castings, cutting metal bars and other tough production work. Hardened along the tooth edge only, it cuts fast, stays sharp, gives a longer run for your money! All standard widths and tooth spacings. Furnished in 100′ and 300′ coils or welded to length for specific machines.



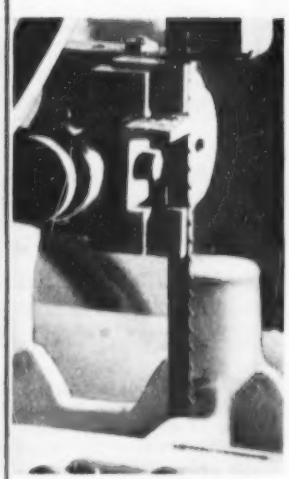
For Contour Cutting and Die Making

In the narrower widths, this edge-holding, smooth cutting blade is an outstanding favorite for contour work. Because the teeth are set with absolute evenness on both sides of the blade, you can depend on straight, on-the-line cuts with no "leading." All standard widths and tooth spacings furnished in 100′ and 300′ coils or welded to specified length.



For Horizontal Cut-Off Work

Furnished either Regular or Wavy Set in the wider widths, this Simonds-made standard tooth blade easily handles the wide variety of cutting required in general shop and steel warehouse operation. All sizes come in 100′ and 300′ coils or welded to length.



For Cutting Soft Materials

This Skip-Tooth Hard Edge Blade has extra gullet capacity with maximum blade strength . . . gives fast, trouble-free service in cutting aluminum, magnesium, plastics, plywood and hardwood. All standard sizes available in 100′ and 300′ coils or welded to length for specific machines.

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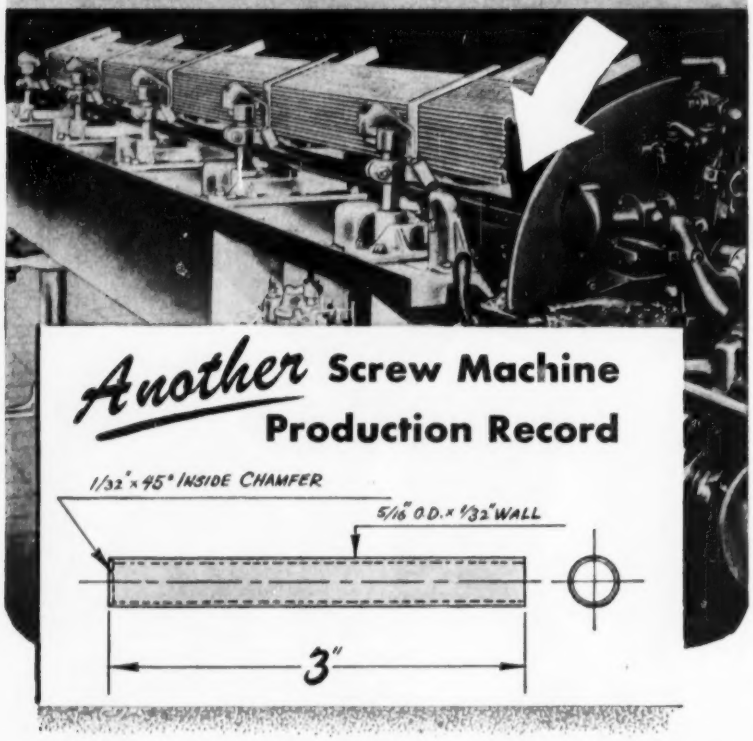
Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

Increases production 50.9% with *Lipe Automatic* Magazine-Loading BAR FEED



THE JOB—Small job shop with six B&S Screw Machines—two operators hand-loading all six. Part made from brass tubing 5/16" O.D. x 1/32" wall. Inside chamfer on one end; other end cut off square. Length 3". Old hand-loading method averaged 560 pieces per hour *per machine*.

THE RESULT—With the installation of the first Lipe Automatic Magazine-Loading Bar Feed on *one machine*, the production of this machine was stepped up to 845 pieces per hour—an increase of 50.9%—approximately 94% of actual gross machine capacity. Other Lipe Automatic Magazine-Loading Bar Feeds are now on order.

THE CONCLUSION—In general machine shops with small, closely supervised screw machine departments, as well as in large multiple-machine production layouts, this fully automatic unit can cut cycle time . . . get *bigger production* . . . on a wide variety of work. *Here's why:*

- Stock is fed to screw machine all the time—not dependent on operator.
- Pressure constantly behind stock.
- Eliminates feed fingers.
- Avoids multiple feed finger feed-outs.
- Model AML gives maximum output of machine—no "cutting air".
- Saves in changeover set-up time.

Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers will gladly study your problem . . . no obligation.

LIPE ROLLWAY — *Lipe*-ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

delegation of authority—something which every successful executive has learned. Perhaps the most deleterious effect of "front-office leaves" is the deterioration of morale due to undermining of the foreman's authority. If management cannot trust its foremen's discretion in simple matters like this it is time to get new foremen.

James K Matter, Jr
Detroit, Mich

•

BAIT FOR SPEED

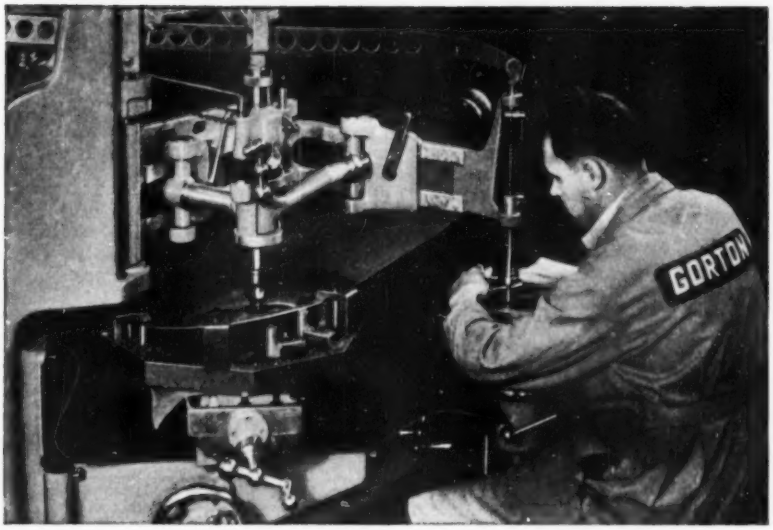
Will an emergency job get better handling if there's a reward in the offing? Or will a responsible worker realize that the company's advantage may be his own?

IT SEEMS a bit late to begin to wonder about the advisability of using bait to secure speed. We have been offering bait for speed ever since piecework was first adopted. When the bait was reduced by cutting piece rates, men learned not to go all-out on the job. The Halsey Premium Plan offered bait to both management and men to prevent the indiscriminate cutting of piece rates that had previously prevailed. So did all the later incentive plans in use today.

Our whole business system, in what we like to call free enterprise, is built on using bait to secure increased production and to lower costs to increase our markets. Lower prices are the bait for the consumer. Of course the bait is not always a cash bonus. It may be better working conditions than in other shops; rest rooms; humane and folksy treatment of employees; and other inducements to work or trade in certain places. Marking a shirt $3.95 instead of $4 is a bait that many fall for.

Men who have been shown that the boss is a square-shooter may not need bait in the form of a bonus, although that usually helps production. Men who have had a square deal, particularly in dull times, seldom need a cash bonus to help the company out of a jam.

Fred H Colvin
Point Pleasant, NJ



Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

Pantography IS NEW —

By George Gorton III
Executive Vice President,
George Gorton Machine Co.

— in the sense that industry at large and Metal Working people in particular are just beginning to appreciate the many advantages Pantography offers to those faced with the Design-Production problems of today and tomorrow.

INDUSTRY'S foremost responsibility right now is to produce faster, to highest quality standards and at lower cost — whether on defense contracts or for our civilian needs.

Today, there are literally thousands of operations being performed throughout industry which can be speeded up, improved in quality and lowered in cost by the use of available models of special machine tools. The modern tracer-controlled Pantograph machine is such a tool. It is both a special purpose machine, ideal for short runs, and it is an accurate single purpose machine which turns out identical parts or pieces to meet tight production schedules.

The tracer-controlled Pantograph machine is used for inside and outside profiling, routing, die sinking, mold cutting, counterboring, contour milling, chamfering, grooving, graduating and engraving in ferrous and non-ferrous metals, as well as in plastics.

This machine performs on flat, uniformly curved, cylindrical, spherical or irregular shapes — it works in either 2 or 3 dimensions, in all directions on a horizontal plane, and vertically. It employs enlarged masters, templates or patterns which are quickly and easily made and operates normally at a reduction ratio thereby increasing accuracy — exclusively characteristic of the pantograph.

Single or repetitive accuracy — from one piece to thousands — manual or full automatic operation depending upon quantities — work sizes from the size of a dime to as large as 10 feet.

A new booklet, "Pantography," explains the process and shows what this type of machine can do for you. It is yours without obligation. Write for it today. If interested, also ask for our latest General Catalog 1655. Address the George Gorton Machine Co., 1509 Racine Street, Racine, Wisconsin, U. S. A.

Backstand Belts cut finishing time 70%

5 minutes on a set-up wheel cut to 1½ minutes with Armour Backstand Belts

Changing from set-up wheels to backstand belts saved 3 minutes 39 seconds in finishing forged paving breaker handles, reports a well-known company*. This operation formerly took 5 minutes 11 seconds. And this wasn't the only saving. Backstand belts outlast 4 to 5 set-up wheels; without dressing they remain flat and true. And due to their uniform grit, they give a better finish.

Belts are only one of the many forms of Armour coated abrasives. There are more than 30,000 different varieties in grit size, backing, etc. We have sheets, disc, rolls, tubes—and specialties to meet your specifications. Your industrial supply distributor will tell you about the Armour line. Call him today!

The complete story of the money-saving backstand belt method is covered in our free booklet offered below. Send the coupon for your copy now!

*Name of company available on request

We recommend buying through your industrial distributor

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Please send me your free booklet, "Backstand Belt Polishing."

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A

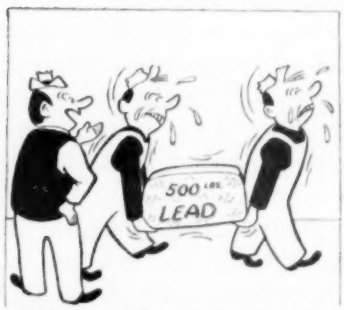
NEW BOOKS

TEXTBOOK OF THE MATERIALS OF ENGINEERING *(Eighth Edition)—By Herbert F Moore, Research Professor of Engineering Materials, Emeritus, Engrg Experiment Station, Univ of Ill., and Mark B Moore, Associate Professor of Mechanical Engrg, Rutgers University. Published by McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, NY. 372 pages. 6 x 9 in. Price $6.*

The first edition of this text (1917) presented a concise analysis of the physical properties of common materials used on structures and machines. This latest edition might be divided into three sections. The first section is an analysis of material failure with particular stress given to metals. The second is concerned with production, and discusses casting, molding, heat treating, alloying, rolling, welding, and aging from the standpoint of the effect on strength, stiffness, ductility, resistance to corrosion, and wear. A study on plastics is part of the last section, devoted to non-metallic materials.

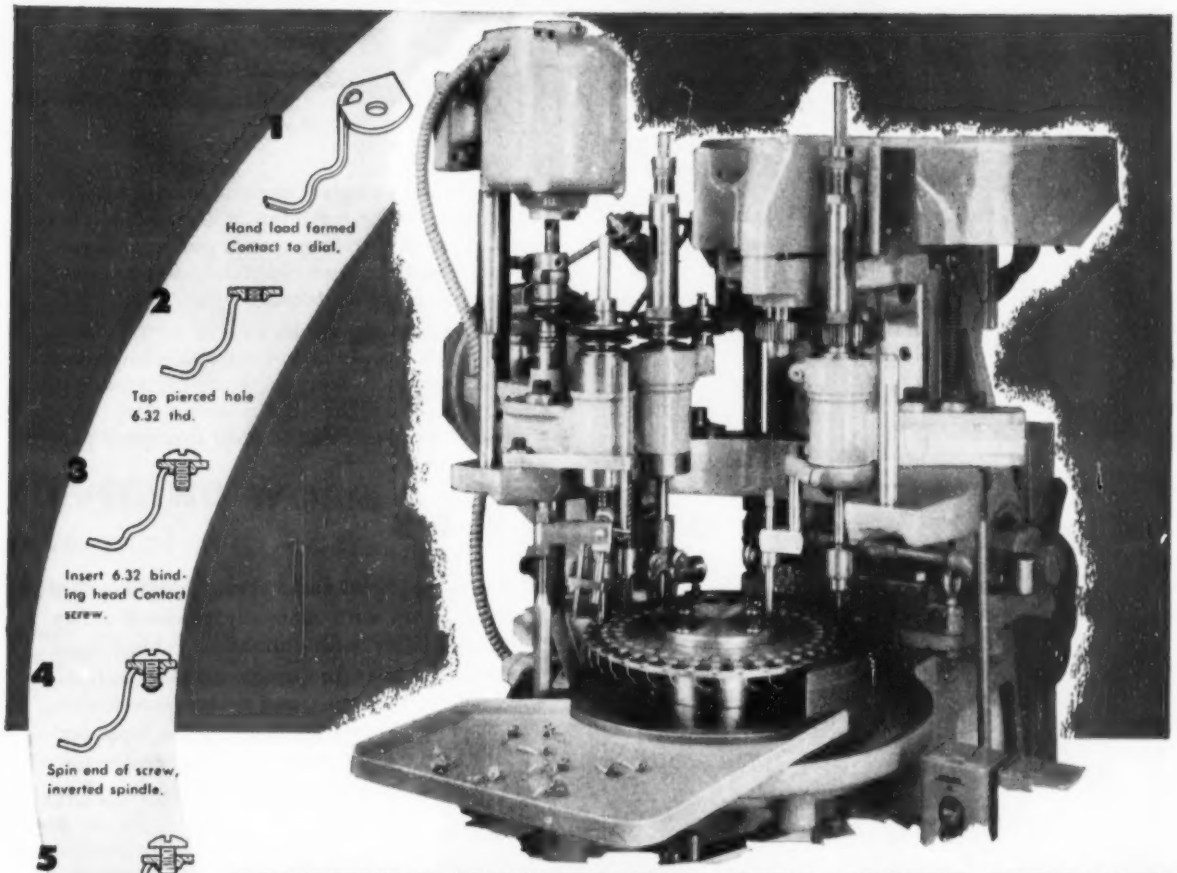
Boron, titanium, and other new materials are covered, although the book is kept concise by limiting all discussions of material properties not closely connected with fatigue resistance. Also new in this edition are treatments of recent information given by the electron microscope, and data on resistance to fatigue under compressive loads.

As with earlier editions, this book is "cleanly" written and provides easy, informal reading. For classroom use, questions and references are appended to each chapter. The book is not burdened with formulas and, in fact, closes with a valuable discussion on the limitations of ordinary formulas for strength of mamaterials. The final pages suggest that atomic physicists, whose data is qualitative, at present, may soon develop quantitative data useful in design of structures and machines.



"Come on, get the lead out! . . ."

Bodine CASE HISTORY NO. 35



✻ Ejection is accomplished by contact on the backed up screw, thus giving automatic inspection for perfect work.

PRODUCING FLUORESCENT TUBE SOCKET CONTACTS

Bodine No. 40-10 Dial Type Tapping and Screw Inserting machine (all safety guards removed) tooled for production of Fluorescent Tube Contacts. Production rate, 60 pieces per minute.

Bodine multiple spindle automatics lead the field in high speed repetitive production of small parts. If your needs involve drilling, tapping, milling, screw inserting, staking and assembly operations . . . there's a Bodine model we can tool to handle several or all of them on one machine. Ask us for case histories showing what we have done to cut costs of accurate quantity production.

"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools."

THE Bodine CORPORATION
BRIDGEPORT CONNECTICUT

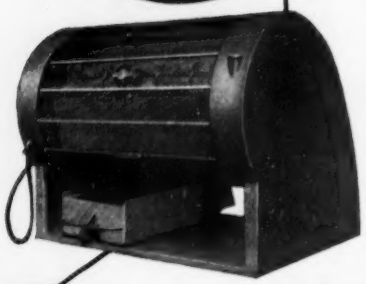
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

28053

Come to TUMBLE GRAV-I-FLO FINISH for ALL your tumbling needs!

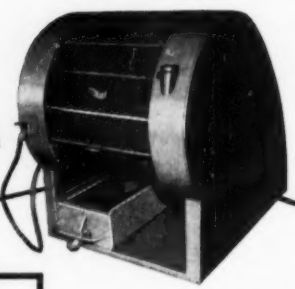
You can get complete equipment and supplies for faster, better tumbling at Grav-i-Flo. This authoritative tumbling source can furnish you, from its years of experience, the correct answer to any tumbling problem.

Larger capacity machines take 31% to 80% more work-load in same floor space. Improved cutting materials shorten cutting cycle by 15% to 25%. Grav-i-Flo installations substantially reduce capital investment, floor space, and production time!



Model 66", two compartments

Model 48", two compartments



Model 36", two compartments

MACHINES

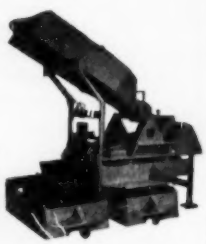
Grav-i-Flo 66", 48" and 36" machines have cam locked doors with manually released safety stops; available with unlined or rubber lined cylinders, constant or variable speed drive, J.I.C. controls, and timers from 5 minute to 20 hour cycles. Equipped with electric wiring and water piping installed ready for plant hook up.

Model 24", two compartments

Designed For Small Lot Production and Laboratory Processing.

ACCESSORIES

Two deck parts-and-chips separator and chip grader



Occupies less floor space. Separates parts quickly without impingements. Grades 3 sizes of chips simultaneously.

Other Grav-i-Flo accessories include tubular yoke hoist pans, chip pans, wash-out doors, screens, chip bins, unloading boots, dip tanks.

Chips and compounds

Grav-i-Flo natural and synthetic deburring and finishing chips and highly developed compounds consistently outperform every type of tumbling process offered on the market.

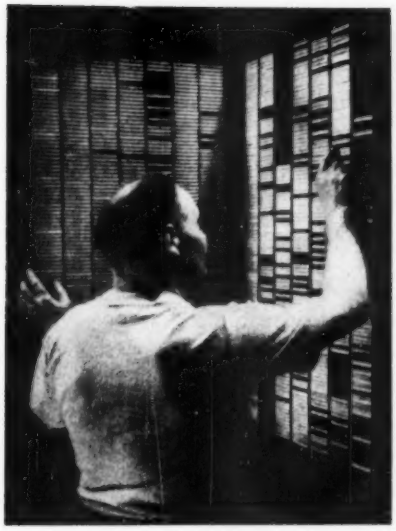
Investigate!

Grav-i-Flo superiority in equipment and supplies has been proved to hundreds of users in many different industries. Let us show you, too, at no obligation. Our representative will visit your plant, or send samples direct to us. Engineering Service available to all users.

SEND FOR CATALOG showing complete line of Grav-i-Flo equipment, accessories and supplies.

THE GRAV-I-FLO CORPORATION

Dept. AM-9, 400 Norwood Avenue
STURGIS, MICHIGAN



CLEVELAND WORM & GEAR CO. cuts tool crib costs . . . increases shop efficiency with McCASKEY

Multiple benefits briefed below are secured thru use of McCaskey Tool Crib Control in the plants of The Cleveland Worm & Gear Company and their affiliate The Farval Corporation, manufacturer of "Centralized Systems of Lubrication".

Mr. Edward F. Mason, Tool Engineer of both companies, recently reported a few of their results as follows:

"When the McCaskey system (shown in the illustrations) was installed, we discovered we were overstocked with tools not often used and understocked on some in regular use. A large part of our Worm & Gear production is custom-made, but with the information now available emergency tool orders are practically eliminated.

"Prevention of hoarding by some of our employees has increased the number of tools available for others without additional purchases.

"Tool Location Boards show at a glance where each tool is stored in the crib. As a result, tools seldom are lost or mislaid and waiting time at the crib window and production delays are reduced to a minimum.

"Our Broken Tool Reports are analyzed as an indication of trouble. Any unusual breakage is reported to the proper department for investigation and total breakage has been cut to a very small figure.

"These and numerous other benefits from the McCaskey installations made in 1942 and 1946 continue to provide lower operating costs in the tool cribs and increased efficiency in the shops."

McCaskey Tool Crib Control and other Control systems offer you comparable "benefits" regardless of the size of your plant or your products. Investigate now by checking and mailing coupon below for complete information. No obligation.

Mail Coupon Today

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INDUSTRIAL CONTROLS
PRODUCTION • INVENTORY
TOOLS • COSTS • PAYROLL
THE McCASKEY REGISTER CO.
ALLIANCE, OHIO
McCaskey Systems, Ltd., Galt, Canada
The McCaskey Register Co., Watford, England

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

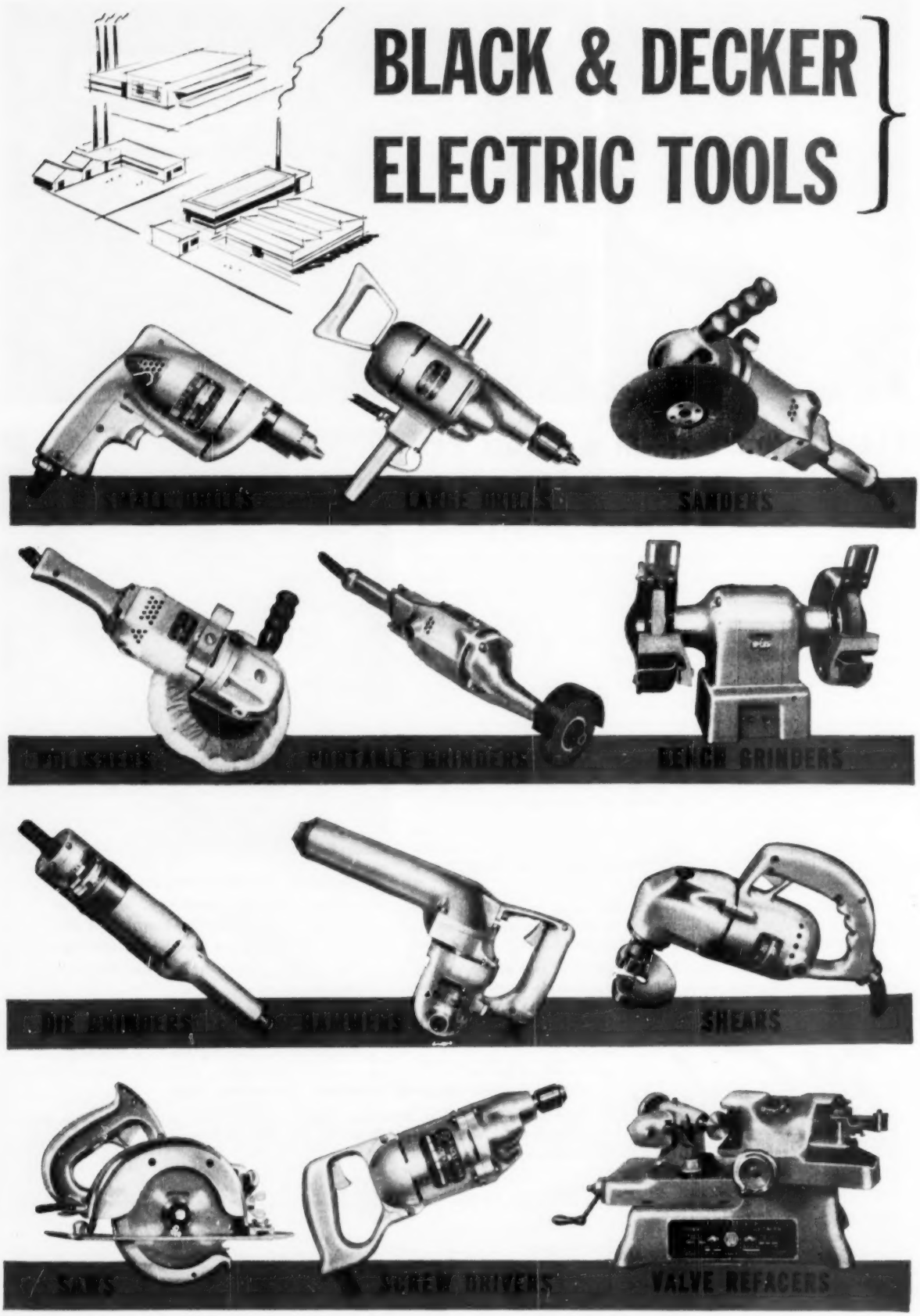
Send full information on McCaskey Controls checked: Tool Crib ☐; Gage & Gage Inspection ☐; Blue Print ☐; Production ☐; Machine Loading ☐; Maintenance ☐; Inventory ☐; Costs ☐.

Name .....

Position .....

Company .....

Address .....


BLACK & DECKER
ELECTRIC TOOLS
SMALL DRILLS
LARGE DRILLS
SANDERS
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PORTABLE GRINDERS
BENCH GRINDERS
DIE GRINDERS
HAMMERS
SHEARS
SAWS
SCREW DRIVERS
VALVE REFACERS

Speed Up Production Slow Down Rising Costs

ASK a production expert, a contractor, a service or maintenance man how to speed up jobs and at the same time cut costs. Chances are he'll say, "Put a Black & Decker Electric Tool on the job."

And there's good reason why Black & Decker rates so high with industry, coast to coast.

Black & Decker is known for the quality that's built into every B&D Tool—the top-flight parts, the husky housings, the compact designs. The versatility, the stamina. Users *know* that B&D Tools speed their operations—saving time, money, manpower, and back-breaking work.

So put Black & Decker Tools on *every* job. It's one sure way to build up your production and hold down costs. For additional information and free catalog, write to: THE BLACK & DECKER MFG. Co., 604 Pennsylvania Ave., Towson 4, Maryland.

Check these Outstanding Features

✓ **WORLD'S MOST COMPLETE LINE**—More kinds of tools . . . greater choice of capacities, speeds, power, and price in most groups to fit your exact requirements.

✓ **ENGINEERING KNOW-HOW**—More than 43 years of leadership in engineering and manufacturing provide the skill and experience that give you the best in modern electric tool improvement.

✓ **SERVICE BRANCHES**—35 factory-owned-and-operated Sales and Service Branches (within 24 hours distance) give you assurance of quick, competent service to keep tools in top condition.

✓ **B&D TOOL SPECIALISTS**—An experienced, fully trained sales organization, familiar with tool applications, to advise and assist you with your specific, tough tooling problems.

✓ **CONVENIENT SOURCES OF SUPPLY**—Leading distributors everywhere stock B&D tools and are ready to give you immediate service. Consult your classified telephone directory under "TOOLS-Electric" for nearest distributor.

B&D Black & Decker PORTABLE ELECTRIC TOOLS

You Can Cut this High Cost Yourself!

*Eye Accidents Cost $176,000,000 a year in LOST MAN-HOURS alone**

If you have a defense contract (or even if you haven't) the shortage of skilled workers is probably one of your plant's most critical problems. Like many other companies perhaps you can obtain extra man-hours of production without adding a man or machine . . . if you PREVENT COSTLY EYE ACCIDENTS!

Your AO Safety Products Representative can show you how a safety goggle costing about $2.30 can prevent 98% of all eye injuries and pay for itself in *less than two hours* of a skilled *worker's time*. Or write American Optical Company, 5139 Vision Park, Southbridge, Mass.

*Estimate. Industrial eye injuries cost over $5 per employed worker per year — with compensation averaging nearly $400 per injured man.

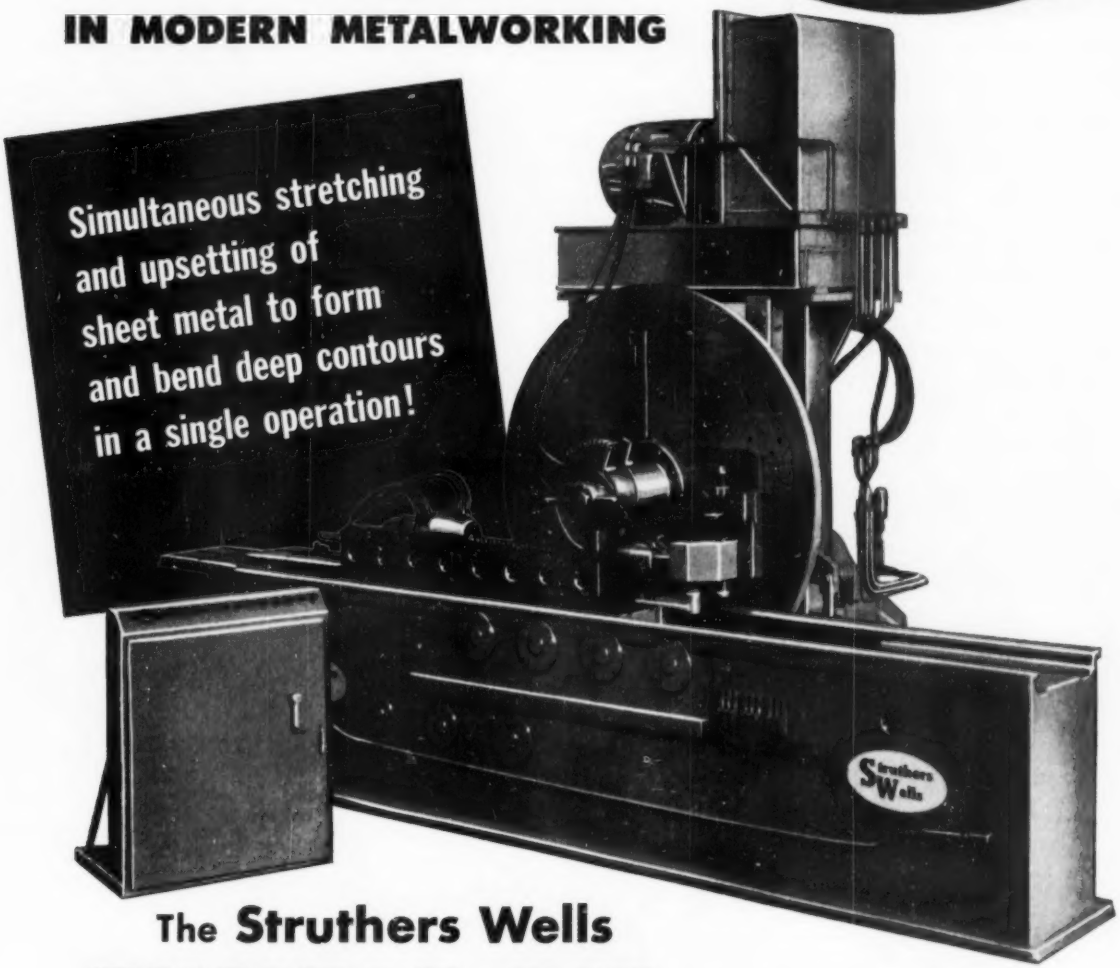
AO's Industrial Program increases production, decreases accidents. Write today for free booklet "Improved Industrial Vision."

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Another **FIRST** *for* Struthers Wells

IN MODERN METALWORKING


Simultaneous stretching and upsetting of sheet metal to form and bend deep contours in a single operation!
Struthers Wells

The Struthers Wells
TUMBLE-DIE MACHINE

Ranging in sizes from 5 tons to 50 tons of stretching capacity, the remarkable new Struthers Wells Tumble-Die Machine forms contour shapes by a combination of stretching and upsetting. With this machine, irregular shapes normally impossible to form by any known sheet metal forming operation are accomplished smoothly and easily as the part is rolled through a circular, rectangular, angular, or any known geometric shape. Now, sheet metal preformed parts such as stove wraparounds, automobile window vents, heavily-contoured casket sides or any structural shapes can be bent with complete success in one operation—at low cost. For complete details on how the Struthers Wells Tumble-Die Machine can solve profitably your particular metal forming problem, write—describing your product in detail.

MACHINERY DIVISION

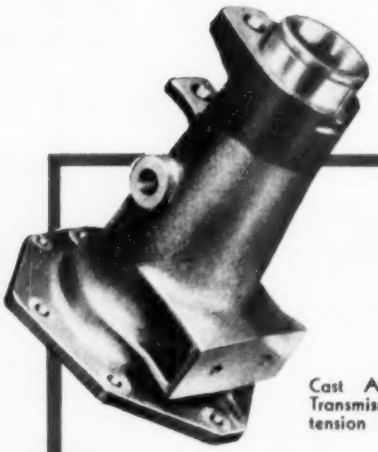
STRUTHERS WELLS CORPORATION • Titusville, Pa.

Offices in Principal Cities

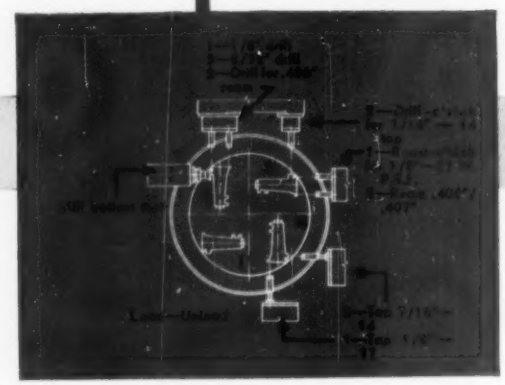
118 *Pieces per hour* 35 *Operations...*

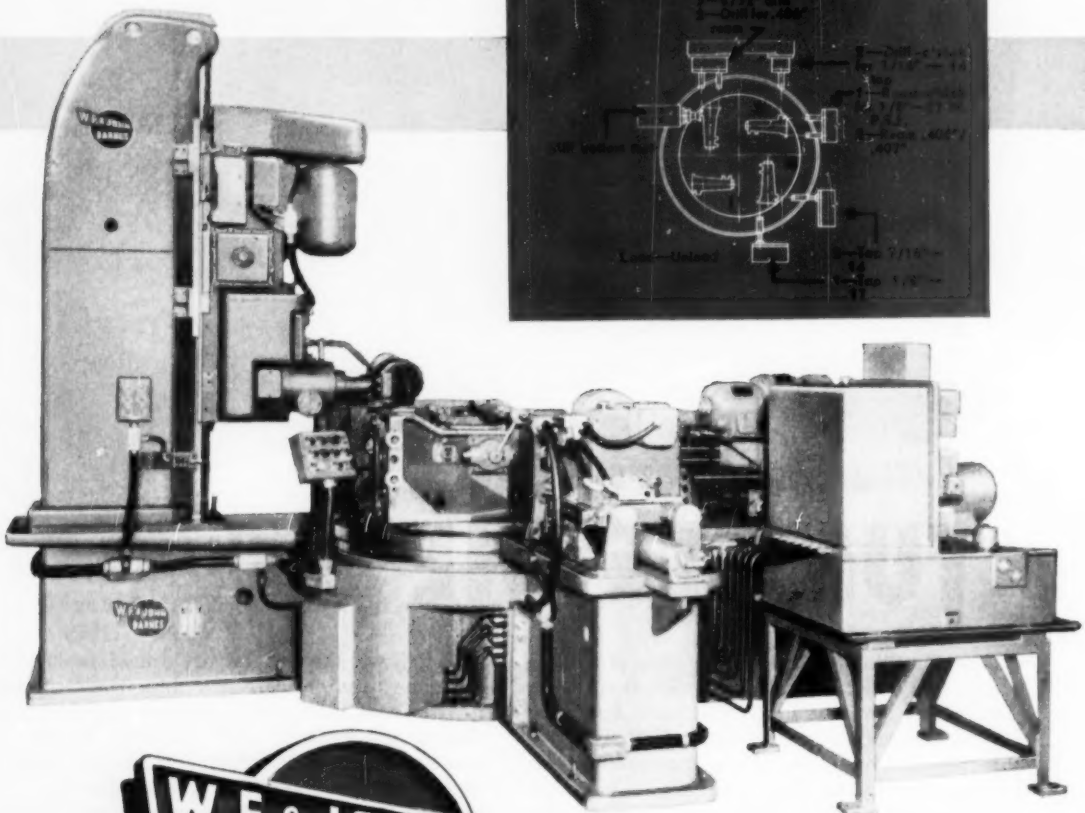
TRANSMISSION EXTENSIONS MACHINED TO CLOSE TOLERANCES ON COMPANION UNITS

Here is another typical example of how W. F. & John Barnes coordinated special machine engineering and building service helps solve complex machining problems. These two companion units, designed to machine cast aluminum automobile transmission extension housings, reduce production costs by combining operations. Note how the parts are positioned and the tooling arranged for efficient machining, and how the over-all design conserves floor space. The two machines perform 35 operations at the required gross production rate of 118 pieces per hour. Whether your production requires large or small machines, you'll find the coordinated services at Barnes can help you solve problems quickly and efficiently.



Cast Aluminum Transmission Extension Housing





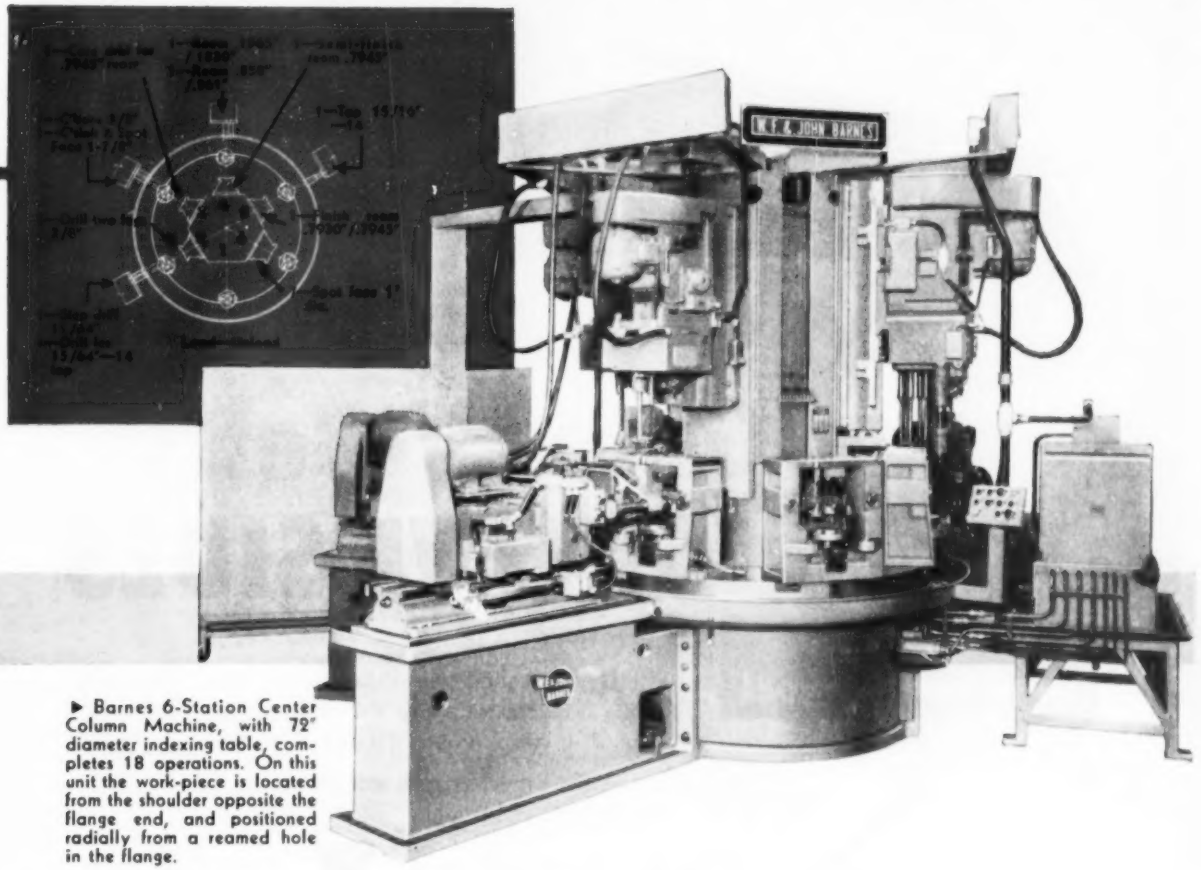
Barnes 4-Station Special Machine with 48" diameter hydraulically operated rotating table. This unit performs 17 operations. Vertical milling of bottom pad in Station No. 2 is completed with a retracting spindle. Fixtures locate part on end bores.

W. F. & JOHN BARNES

W. F. & JOHN BARNES COMPANY

MULTIPLE SPINDLE DRILLING • BORING • TAPPING MACHINES

. . . ON W. F. & JOHN BARNES SPECIAL MACHINES



▶ Barnes 6-Station Center Column Machine, with 72" diameter indexing table, completes 18 operations. On this unit the work-piece is located from the shoulder opposite the flange end, and positioned radially from a reamed hole in the flange.

BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES

1 **SPECIALIZED MANUFACTURING FACILITIES**—75-year background, large well equipped plant efficiently tooled to produce high production machines.

2 **SPECIAL HYDRAULIC EQUIPMENT**—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.

3 **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS** — individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions.

4 **SPECIAL GAUGES, FIXTURES, TOOLS** — designed for each individual machining problem, assure accuracy of operations at high production speeds.

5 **SPECIAL HANDLING AND CONVEYOR EQUIPMENT** — designed and built to reduce work handling, effect maximum safety and efficiency.

6 **COORDINATED DESIGN AND ENGINEERING** Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

Write **FOR FREE DATA**

"Coordinated Machine Engineering" — a free booklet describing modern machines and mass production techniques. Write for your copy today.

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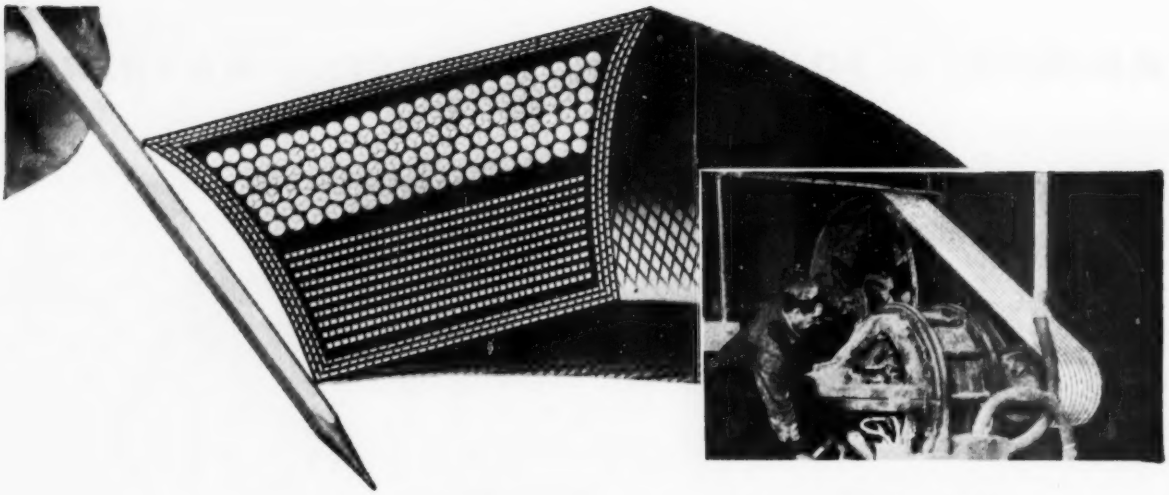
AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES



Gates V-Belts are built with CONCAVE SIDES

(U.S. PATENT NO. 1813698)

...that's why they last longer!

If you want lower V-Belt costs, just make this simple test...pick up *any* V-Belt and bend it as if it were going around a pulley.

As the belt bends, grip its sides between your fingers and thumb.

If the belt has *straight sides* you feel the sides bulge out. This forces the sides of the belt to press *unevenly* against the V-pulley . . . and you get concentrated wear at the points shown by the arrows.

Now, try this same test with the V-Belt that is built with CONCAVE SIDES **—the Gates Vulco Rope.**

As this belt bends, you can feel the CONCAVE SIDES *fill out* and become perfectly straight.

These sides press *evenly* against the V-pulley. All wear is distributed *uniformly* across the full width of the Gates Vulco Rope and the CONCAVE SIDES therefore mean longer belt life and lower V-Belt costs for you.

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE SIDES—the Gates Vulco Rope!

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

CS-535

V-Belts—Hose
Molded Rubber Goods
for Industry
World's Largest Maker of V-Belts

Gates® VULCO ROPE **DRIVES**

THE GATES RUBBER COMPANY • DENVER, U.S.A.

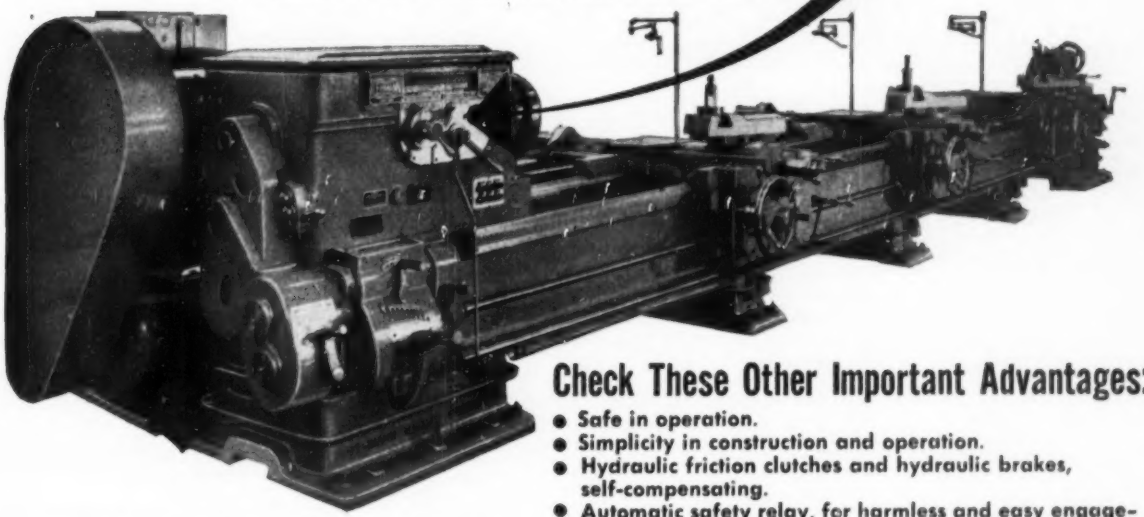
Just a "Twist of the Wrist" does it!

... The Lehmann HYDRATROL LATHE

gives 16 Spindle Speed changes with Automatic Slide Rule Selection.

Just a turn of the hand wheel on the front of the headstock of the LEHMANN Hydratrol Lathe gives you a speed change! An automatic slide rule, co-ordinated with the movement of the handle, shows spindle revolutions per minute and indicates a slide rule calculation of the cutting speeds in feet per minute.

Calculation by the operator is unnecessary. The rotary handle provides all speed changes for 16 forward and 8 reverse speeds. No need for intermediate stop; unnecessary to disengage the friction driving clutch to change speed.



Check These Other Important Advantages:

- Safe in operation.
- Simplicity in construction and operation.
- Hydraulic friction clutches and hydraulic brakes, self-compensating.
- Automatic safety relay, for harmless and easy engagement of positive clutches when speeds are changed.
- Spindle release for chucking.
- Perfect, safety-control lubrication with filtered oil.
- Gears constantly in mesh.

Write today for additional information or catalog — or — send prints for time-and-money-saving recommendation!

LEHMANN MACHINE COMPANY
GRAND AT CHOUTEAU • ST. LOUIS 3, MO.
DIVISION OF NOVO ENGINE CO.

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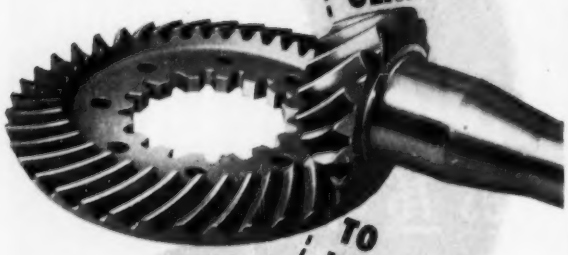
SPIRAL BEVEL GEARING



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Full Range To 30" Diameter

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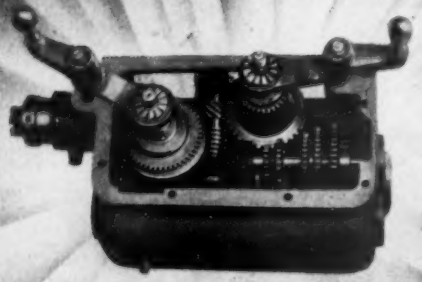
Always Meet the Specifications

For twenty-five years Acme Gears have been giving unsurpassed service in industrial, automotive, marine and aircraft equipment.



Acme facilities include over one hundred major machine tools for gear cutting to your exact needs.

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EVERY TYPE PRECISION GEAR

. . . produced to your specifications

"Mass Gear" offers machining and cutting facilities for producing all types of precision gears in small and medium sizes. Gear tooth finishing and inspection equipment are backed by a competent staff of gear-producing specialists.

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Geared to PRECISION PRODUCTION

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Bevel Gears	Sprockets
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WORCESTER gear works, inc.

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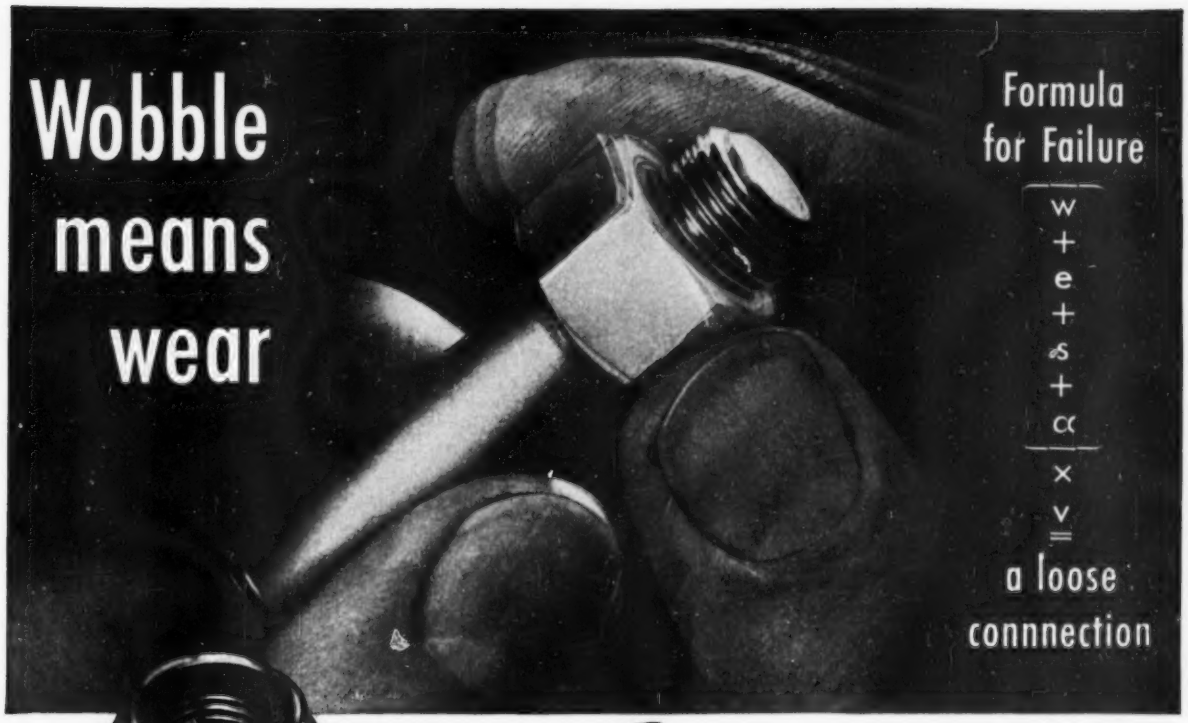
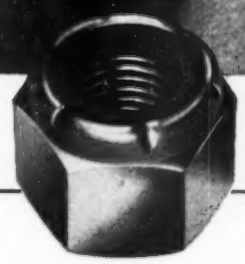
(See our ad in 1954 Annual Handbook)





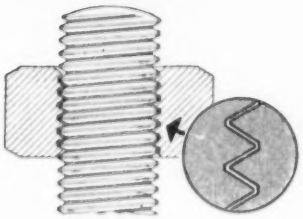
Elastic Stop nuts can't wobble

Formula for Failure—[(w) Initial thread wear + (e) bolt stretch + (s) thermal expansion or contraction + (α) wobble] × (v) vibration = a loose connection.

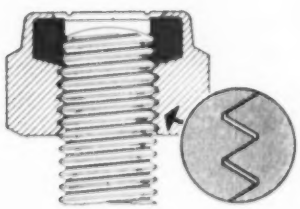
WOBBLE, permitted by normal axial thread play, and vibration are two of the major elements contributing to thread wear, loose connections and ultimate failure of a threaded fastener.

One device — the elastic locking insert — eliminates axial play and dampens destructive, wear-producing vibration. Because of the locking action of ESNA's famous red elastic collar, ELASTIC STOP nuts *do not loosen under vibration.*

Other important ESNA advantages include quick application and precise adjustment, reuseability, protection against liquid seepage, and uniform bolt loading. Mail our coupon for design information.



YOU CAN WOBBLE AN ORDINARY NUT AND BOLT with your fingers. This is the result of the tolerance spread permitted by the several classes of thread fit.



GRIPPING THE BOLT WITH A PERFECT FIT, ESNA's red elastic collar enforces a constant downward pressure that eliminates axial play, enforcing a positive contact between load-carrying sides of bolt and nut threads.

ELASTIC STOP NUT CORPORATION OF AMERICA

also maker of the ROLLPIN

Elastic Stop Nut Corporation of America
Dept. N36-99, 2330 Vauxhall Road, Union, N. J.
Please send the following free fastening information:

☐ ELASTIC STOP nut bulletin

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name _____ Title _____

Street _____

City _____ Zone _____ State _____

Only ESNA manufactures a complete line of all types and sizes of self-locking nuts

Complete, Ready to Install and Plug In

MOTOR:
1/15 hp, 110 V. AC 60 Cycle
MECHANISM:
Bronze Gear, Steel Worm
WEIGHT:
Approximately 10 lbs., Net
DIMENSIONS:
4½" x 5½" x 8", less connecting shaft.

Four speeds in either direction! 1.2, 2.1, 3.2, and 4.5 inches of table travel per minute . . . all independent of spindle speed and direction of rotation.

Powerful! Table drive equals or exceeds milling capacity of the spindle.

Table travel instantly reversible! Reversible motor and simple two-way switch instantly reverses direction of table feed. Adjustable stops limit table travel in either direction.

Doesn't interfere with manual operation! Lever quickly disengages worm gear drive, permitting use of ordinary hand feeds when desired!

Easily installed in 10-15 minutes! Two bolts secure unit to end of table on any hand-screw model. Slots in adapter permit easy alignment with lead screw, eliminate fussy hole location.

(Note—not adaptable to production models with rack and pinion table feed.)

Available factory-installed on all new Benchmaster Mills, or as an accessory for all Benchmasters now in use!

See your Benchmaster dealer today!

Benchmaster
Manufacturing Co.
1835 W. Rosecrans Avenue
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benchmaster

World's largest manufacturer of small punch presses and mills.

TUBE END FORMING MACHINERY
for
Beading — Flaring — Flanging — Expanding — Reducing — Sinking — Swaging — Grooving — Double Lap Flaring and Flanging ⅛" to 4½" TUBING.

Write for General Bulletin G-3

The **VAILL** *Engineering Company*

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PUMP GUIDE

for Maintenance Men...

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TUTHILL MODEL CK HIGH-PRESSURE PUMPS

NOW READY TO HELP YOU

This concise book gives you types and sizes of Tuthill High Pressure Pumps to meet any requirement for hydraulic service where the operating pressure does not exceed 400 p.s.i. Included is data on the following types in capacities from 5 to 200 g.p.m.

MODEL CK—Compact, self-priming, uni-directional. Spring-loaded packing. Direct drive or belted units.

MODEL CKB—Same as Model CK, with dependable Tuthill mechanical shaft seal.

MODEL RCK—Includes Tuthill's exclusive automatic reversing feature. Available also with mechanical seal as Model RCKB.

Write for Tuthill Catalog No. 103 today.

TUTHILL PUMPS FOR ALL PURPOSES

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Dependable Rotary Pumps since 1927
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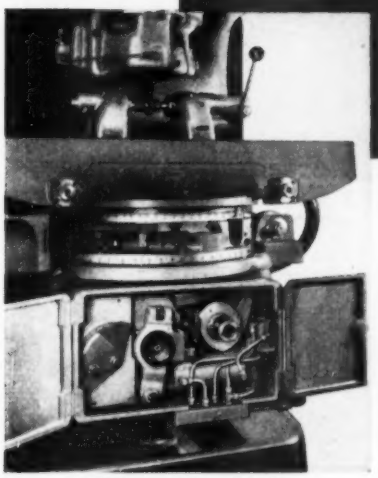
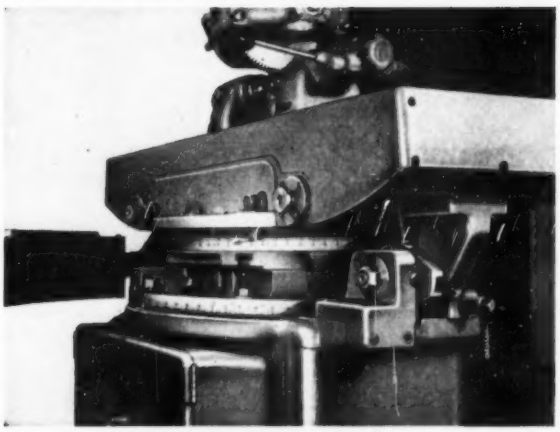
Canadian Affiliate:
Ingersoll Machine & Tool Company, Ltd.
Ingersoll, Ontario, Canada

An Important Contribution

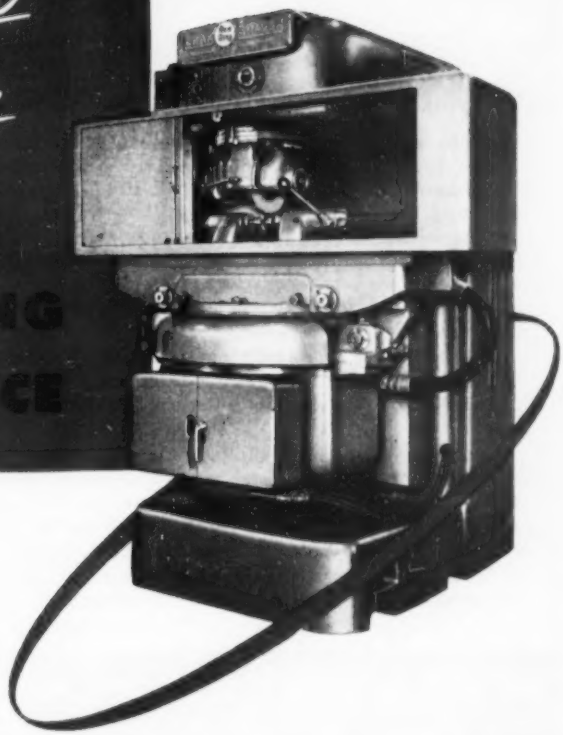
To GEAR SHAVING PRACTICE



Differential up-feed mechanism



Crowning cam and bracket



Two new features are now optionally available with the Red Ring Gear Shaving Machine Model GCU — Automatic Differential Up-feed and Conventional Crowning. So equipped, any of the recognized processes in the field of rotary gear shaving may be performed on this machine. It thus becomes economically applicable to both high production and to job shop operations and to gears of all characteristics within its size range.

Specifically the Model GCU with these additions can be used for:

(1) Diagonal shaving at fixed center distance on a two stroke cycle.
(2) Diagonal shaving on an automatic multi-stroke cycle with selected increments of up-feed and dwell.
(3) Conventional shaving on an automatic multi-stroke cycle with selected increments of up-feed and dwell.
(4) Precision gear crowning accomplished by rocking the table during any conventional shaving cycle.
(5) Taper shaving to specification.

Automatic cycling is precise and very fast. Production rates are high and cutter life has been increased to as much as 200%.

Write for Bulletin S53-7 which gives all the details of this important new development.

6501

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Positive action of BARRETT TYPHOON CENTRIFUGAL WASHERS provides for quick, thorough parts cleansing

In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket. That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaminated fluid.

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Several Barrett installations involve the use of four machines operated by one man who loads and unloads in three minute cycles. Washing time is only one minute. Another type of set-up provides for recovering oil, washing, drying, and coating with rust-proofing material.

As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

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Barrett Centrifugal Washer —made in capacities from 13 to 38 cu. ft. per hour. Each size, depending on condition, will perform at the rate of 20 duty cycles per hour.

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Feeds ferrous, non-ferrous strip or sheet . . . faster, safer. Use for stamping, shearing. Right or left hand non-slip fitted grip, self-adjusting. Sturay, hardened work surfaces. FULLY GUARANTEED.

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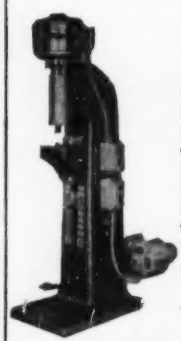

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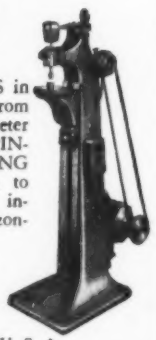

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85 Sillimas Ave., Bridgeport, Conn., U. S. A.

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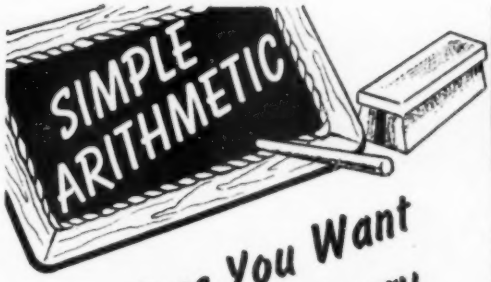

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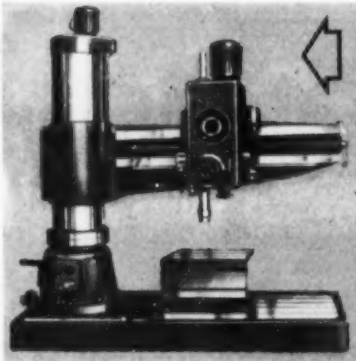

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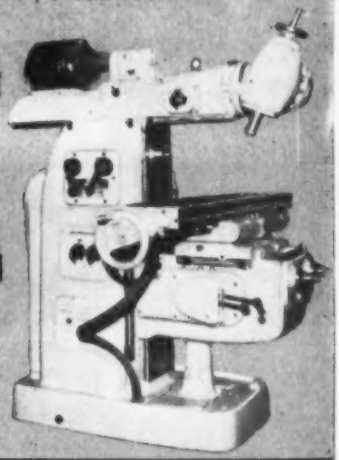

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Universal or Plain
Longitudinal Travel—31½"
Spindle to Column—35"
Available with Motorized
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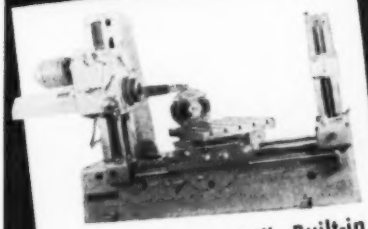
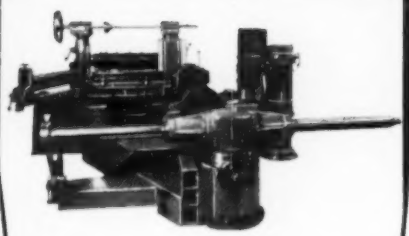
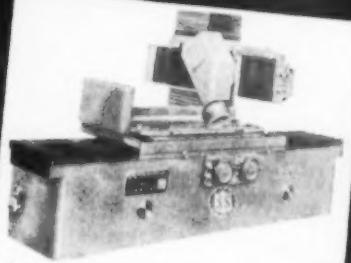


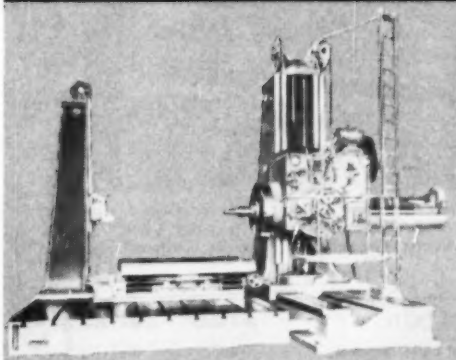
S&S 3" Boring Mill, Built-in Rotary Table, 70" to Outboard, 31½" Spindle to Table, Available up to 92" to Outboard, 48" Spindle to Table



New Slitters, All Sizes, with Coilers and Recoilers

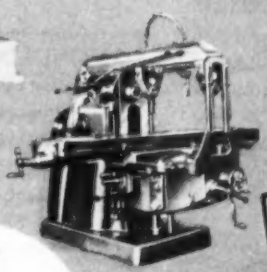


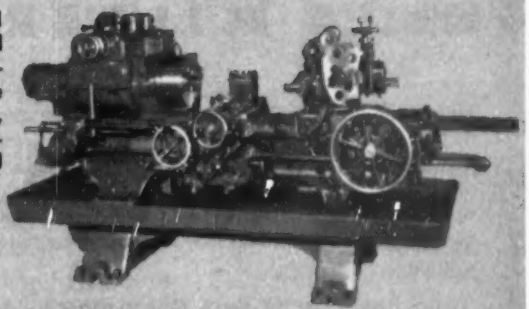
New S & S Precision Openside Hydraulic Grinder; Surface, Vertical and Angular. Sizes up to 40" x 40" x 96"



Horizontal Boring Mills, Table and Floor Type, up to 10"; Rotary Tables of Desired Sizes Available

No. 4 Di Palo Dial Type High-Speed Plain Milling Machine. Available Also: Nos. 2, 3, 4, 5, 6, 10, Plain, Universal and Vertical





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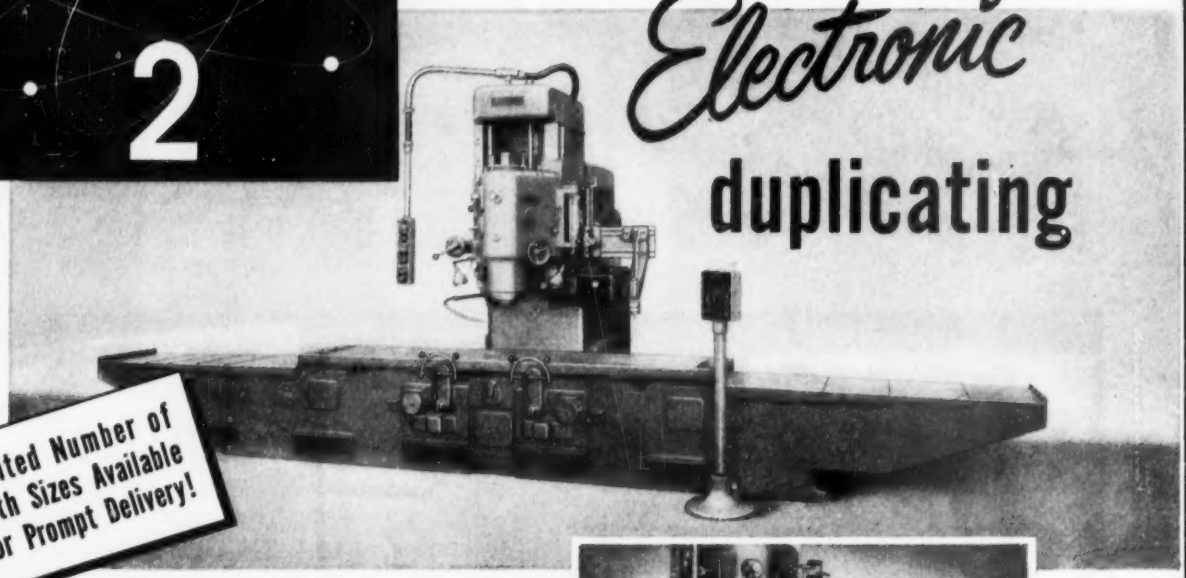

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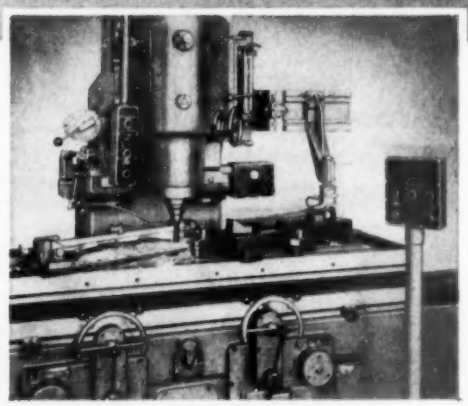
Here's the ultimate in electronic machine control — at your fingertips! The Reed-Prentice No. 4 Vertical Miller, featuring electronic control for all feeds, provides unsurpassed accuracy in complex duplicating operations when equipped with a General Electric two or three-dimensional electronic contour follower system.

Today Reed-Prentice No. 4 Millers perform milling and profiling work for such leading manufacturers as General Motors Corp., Allis-Chalmers Mfg. Co., Chrysler Corp., Kaiser Mfg. Corp., Westinghouse Electric Corp. and National Pressure Cooker Co.



Two-dimensional electronic contour follower system on No. 4 Miller duplicating aircraft part for Kaiser Manufacturing Company of Richmond, California.

SPECIFICATIONS		#4-60"	#4-96"
Longitudinal travel of table		60"	96"
Travel of cross slide		24"	24"
Table working surface		24 x 96"	24 x 132"
Feed range		½ to 25" per minute	
Spindle speeds:	20 H.P. motor	45-1800 RPM	
	25 or 30 HP motor	90-1800 RPM	

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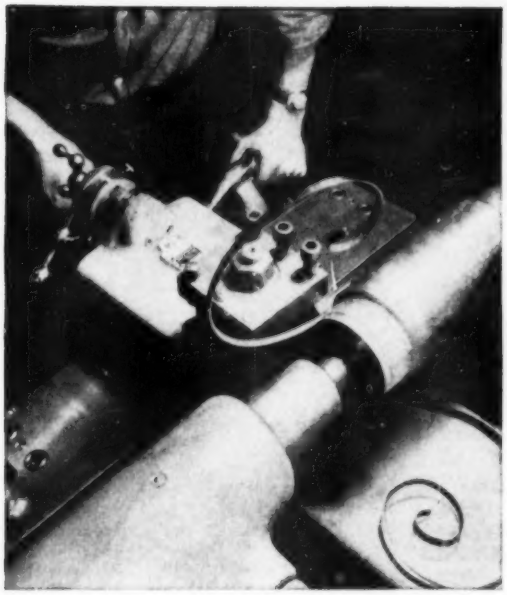
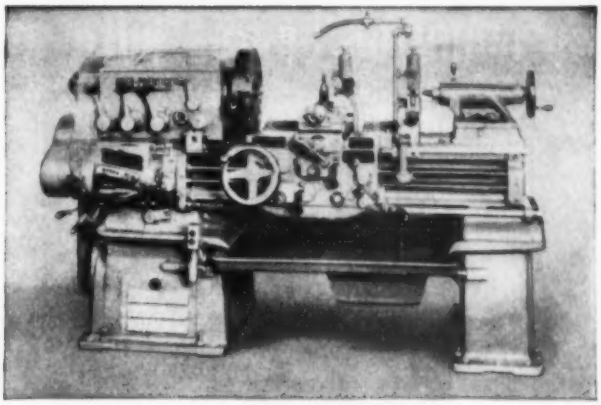
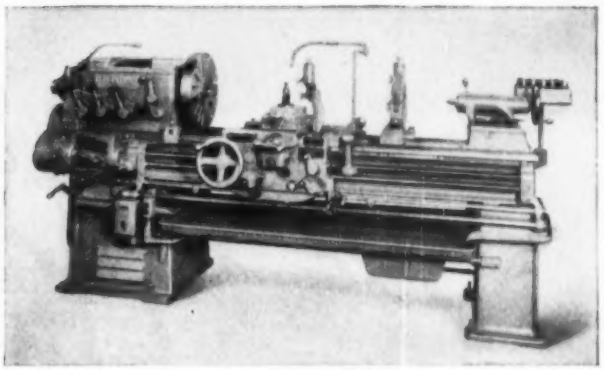




Reed-Prentice 14" Engine Lathe



Reed-Prentice 16" Toolroom Lathe

ACCURATE **HEAVY-DUTY** TURNING on

Reed-Prentice 14", 16" and 20" Lathes

Rugged construction, improved headstock design and rigid spindle mounting add up to fast, accurate turning on Reed-Prentice Sliding Gear Head Lathes. Redesigned headstock permits heavier cuts and faster turning. Both 14" and 16" Engine and Toolroom models offer spindle speeds up to 1200 R.P.M. Distance between centers is from 30" up in 24" increments.

On all Reed-Prentice Lathes, carriage bears on front and rear vees and also on the horizontal and flat bearings. Each flat surface is adjustably gibbed for wear to insure permanent cutting tool support. Separate lead-screw and feed rod construction with safety interlock prevents engagement of feed rod and leadscrew at the same time.

Hardened steel bedways for carriage vee bearings only can be furnished on Reed-Prentice 14" and 16" Lathes. Further details upon request.

Catalog #40, containing illustrated circulars on Reed-Prentice 14", 16" & 20" Lathes, is yours for the asking.

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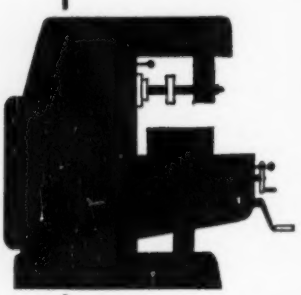

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STONE HIGH-SPEED CUTTING MACHINERY

You Can Cut All Metals At Less Than 4 SEC. Per Square Inch

LOOK AT THESE TYPICAL CUTTING TIMES			
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	CARBON STEEL	1½" Dia.	6 Seconds
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	HIGH SPEED STEEL	2" Dia.	9 Seconds
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	ANGLE IRON	3x3x¼"	5 Seconds

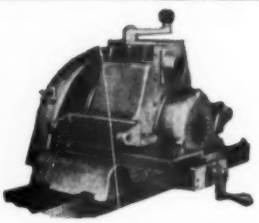
MODELS AVAILABLE FOR ALL SHOP NEEDS

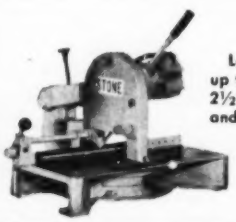
MODEL M-75
HEAVY DUTY

For continuous production cutting of solids up to 2½"—pipe and structurals up to 4". Equipped with full 7½" h.p. geared-in-head motor engineered with positive drive for 33% greater efficiency.

MODEL SS-20
TRAVERSE TYPE

Operates in horizontal plane on guided rails for cutting larger structurals, extrusions, sheet, plate with cuts up to nine feet in length. Cuts wet or dry.





MODEL M-14

Low cost machine for cutting solids up to 2"—pipe and structurals up to 2½". Two models—straight cut-off and swivel head for angle cutting to 45°. Bench or floor model. Equipped with full 3½ h.p. geared-in-head motor engineered with positive drive.

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It's good to see your smile of *satisfaction*, Frank!

Mr. Franklin, foreman, (Frank to us), knows his taps and gages. He measures their efficiency by the one standard of "*performance-ability*"... performance on the job and the cost records. That's why this experienced supervisor specifies —

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The Hanson Process is the original method of *finishing after hardening*. Through this process, Hanson-Whitney has for 34 years produced a quality line of finished precision taps and gages to the complete satisfaction of our customers.

When threaded parts reach inspection, you will realize the value of "Co-ordinated Responsibility" that the Hanson Process contributes to the solution of your threading problems — the economical dependability of having one manufacturer furnish all of the production elements — precision machine tools, cutting tools and gages.

Yes, Mr. Franklin, the dependable, day-in, day-out performance of these Hanson-Whitney products is recorded on your cost sheets. Naturally, the right tap or gage for the specific job is essential. Ask the Hanson-Whitney representative for recommendations.

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* Our "Mr. Franklin" is a composite character typical of the thousands of experienced practical machinists throughout the country. You, too, have a Mr. Franklin in your shop... ask him what he thinks about Hanson-Whitney products.

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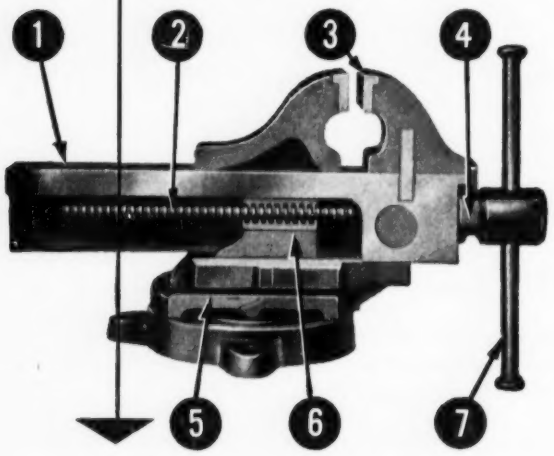

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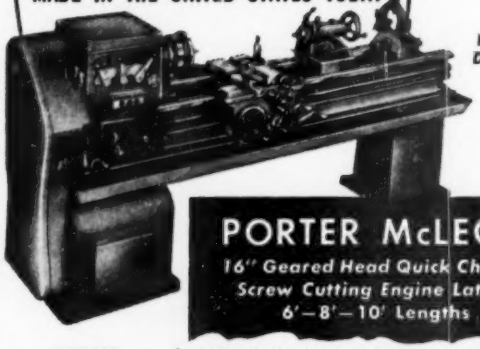
ONE OF THE FINEST ENGINE LATHES MADE IN THE UNITED STATES TODAY



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PORTER McLEOD
16" Geared Head Quick Change Screw Cutting Engine Lathes
6'—8'—10' Lengths

PARTIAL SPECIFICATIONS

Distance between centers (6'): 36"; (8'0): 60"; (10'): 84". Hole through spindle: 1-5/16". 12 spindle speeds, 23.6 to 1000 RPM. Anti-friction bearing headstock. 5 HP motor.

Sales territories open

Rigid and vibration-free, the Porter McLeod lathe is the product of a 60 year old company. More than 2500 are in service! All headstock gears are made of specially hardened chrome nickel steel. The spindle, also of chrome nickel steel, is forged and bored from solid stock, mounted front and rear on Timken roller bearings.

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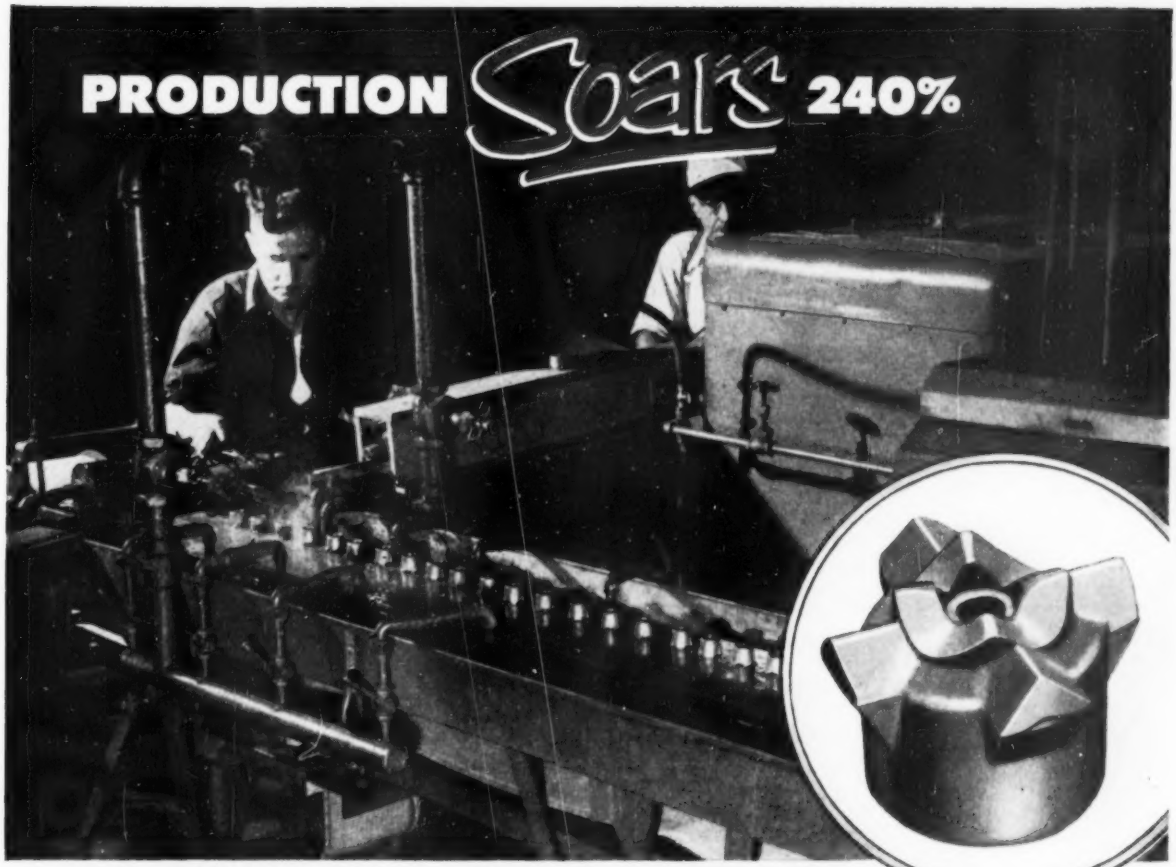

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COSTS DOWN. While production skyrocketed, costs fell—from $7.46 per hundred parts to $6.50, a savings of almost exactly one cent per part on the hardening operation alone.

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This Mine Drill Bit is made of .90 carbon drill steel. Cutting face is hardened to 65 R. C. Thompson also uses TOCCO to heat stock for forging these parts.

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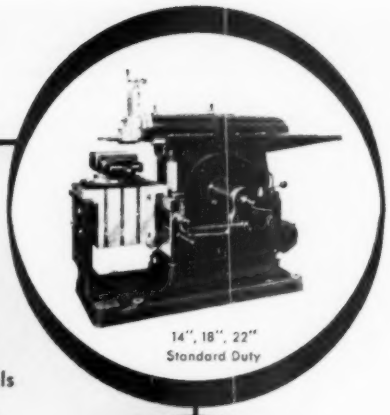

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Standard Duty

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Heavy Duty

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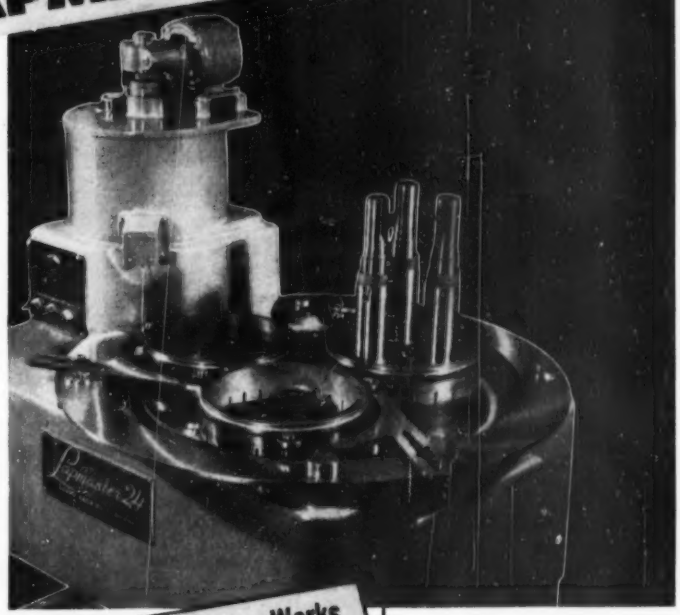
WHY YOU GET

Precision Flatness, Finish and Parallelity in Production Quantities . . .

WITH A LAPMASTER



Here is the machine to do the job if you want precision flatness in production quantities at an economical rate. Lapmaster machines readily lap to the extreme close tolerance of one light band (0000116") or less. In addition, they produce an extremely fine finish to as low as 1 RMS.

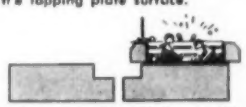
Check these features and investigate the possibilities for the Lapmaster in your plant.

1. Operator requires no previous lapping experience.
2. Automatic timer provides controlled lapping cycle for production efficiency and allows time for pre-loading work-holders.
3. Simplicity of design allows ease of loading and unloading.
4. Loose abrasive distributed evenly over lapping area insures uniform results.
5. Serrated lap plate collects and disposes of spent compound and removed stock.
6. Precision laps identical parts or parts of various shapes, heights and materials in one cycle.
7. Self-conditioning lap plate eliminates down time for truing or replacement.

How the Lapmaster Works

The work being lapped causes wear on heavy cast iron lap plate.

As the work is wearing the lap, the conditioning rings are continually conditioning the lapping plate surface.



Since the wear action of the conditioning rings is greater than the wear caused by the work being lapped, the flatness of the lap plate is automatically maintained.

FREE DATA

Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

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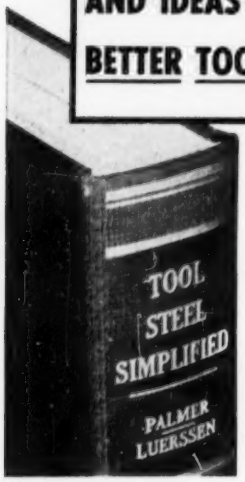

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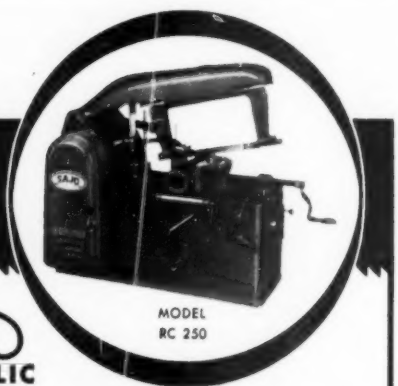

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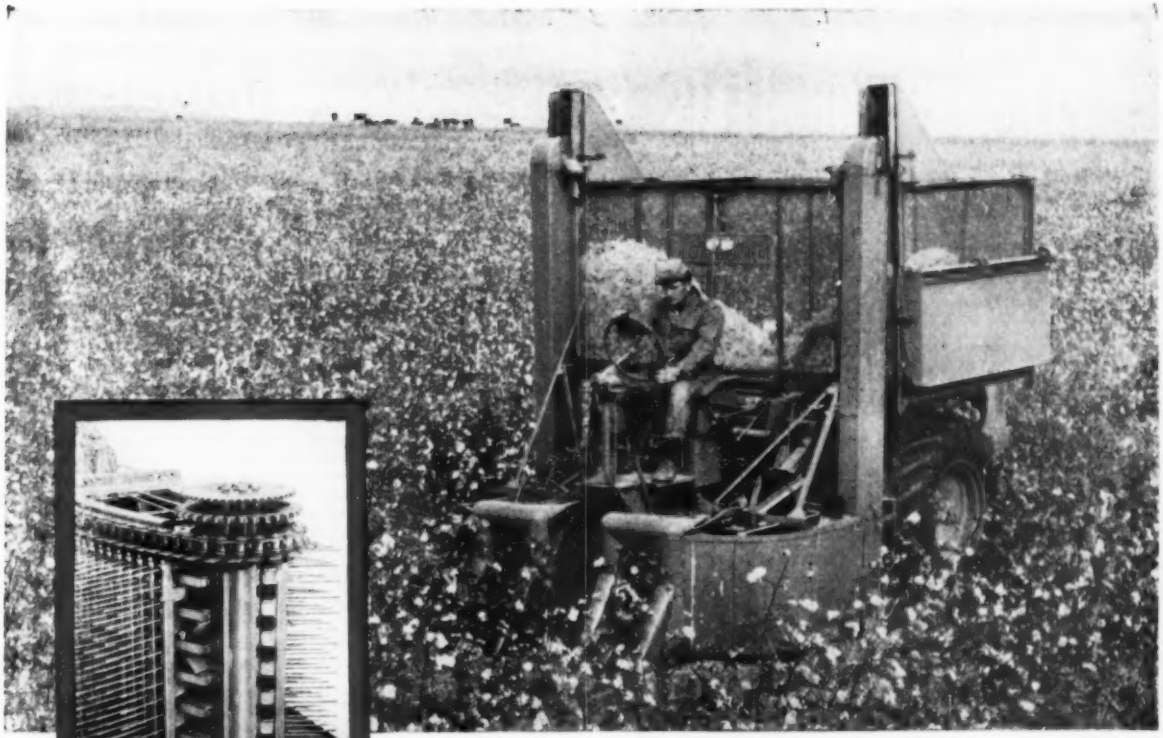

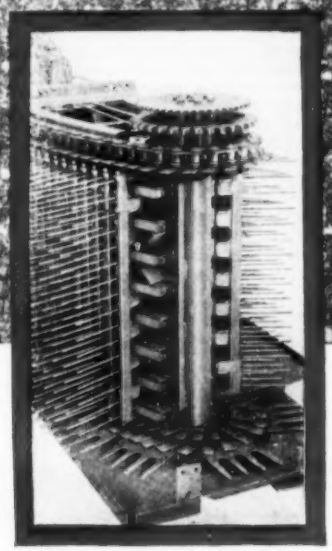

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It's intriguing to watch this amazing machine. It has 2,560 *rotating steel fingers* that gently probe the open cotton bolls, and deftly pick out the soft, white cotton fibres.

A few years back when the new cotton picker was in the design and testing stage, the carbon steel fingers . . all 2,560 of them came up for some serious attention. The heat treating *had* to be right. For the "fingers" had to be straight and they had to be hard. Just the right hardness . . not *too* hard or they might snap off, and not too soft or they might bend.

Allis-Chalmers brought their problem to the metallurgical and heat treating research laboratories of Lindberg Steel Treating Co. In a short time, Lindberg heat treating specialists, in cooperation with Allis-Chalmers engineers, developed an effective and successful process. It permitted the heat treating of the carbon steel fingers without scaling . . and without distortion . . to precisely the right physical properties.

Solving problems in heat treating is an everyday experience for Lindberg Steel Treating Company. Some 34 metallurgical engineers and metallurgists with a composite heat treating experience of more than 650 years are available to consult with you on any heat treating problem. Your inquiry is invited.

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Polished, spherical head hardened to Rockwell C-64. Balance of screw hardened to Rockwell C-40.

Screw body continuous threaded, cross-drilled, and rifle-drilled for oil passages.

Base machined for socket-head installation and adjustment. All measurements held to specifications.

When you run into screw requirements like this special part, you can rely on Mac-it to produce it for you—**exactly to your specifications!**

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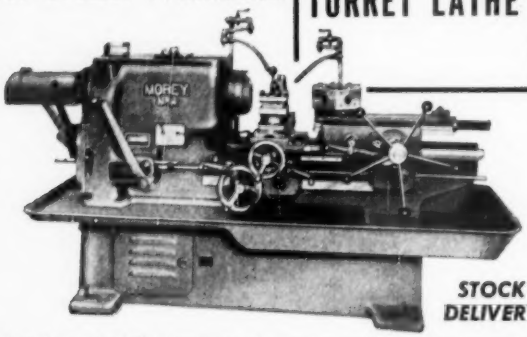

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Bar work capacity	2" x 12"
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Swing over bed	19½"
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Spindle speeds (back gear ratio) From 35 to 1560 RPM. Infinite variations with constant speed, AC 1200 RPM motor 1:7.2	
Motor	7½ HP.

Supplied with hardened steel bedways.

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PROBLEM: To produce an accurate hole with a 20 micro-inch finish in high carbon, high chrome (25 to 28%) castings—at a reasonable cost.

MATERIAL: Chrome-Iron alloy casting
HARDNESS: 36 to 42 Rockwell "C"
HOLE LENGTH: 3.5"
HOLE DIAMETER: .6735
STOCK REMOVAL: .002" to .0025"
TOLERANCE: ± .0005"
FINISH: 20 micro-inches, RMS
MANUFACTURER: American Non-Gran Bronze Co.

SOLUTION: Sunnen Model MB1290D Honing Machine with K-20 type mandrels and 220 grit, medium hardness stones, and Sunnen Honing Oil. Only preparation is rough reaming.

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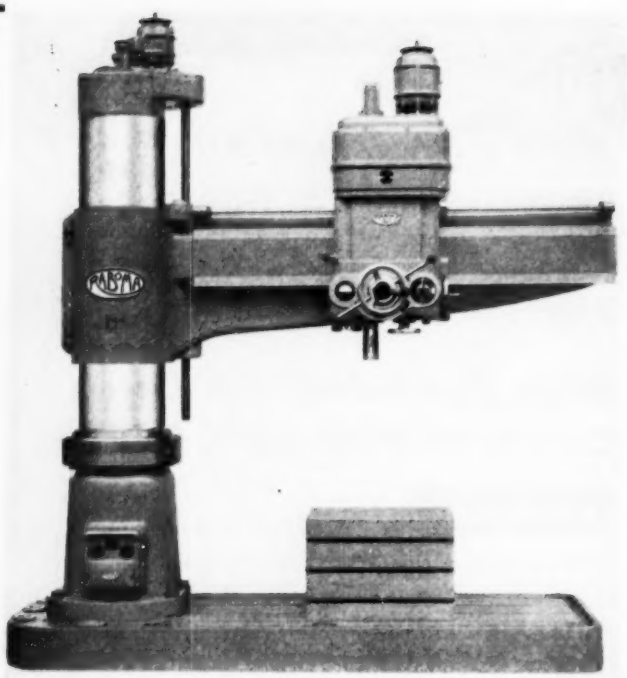

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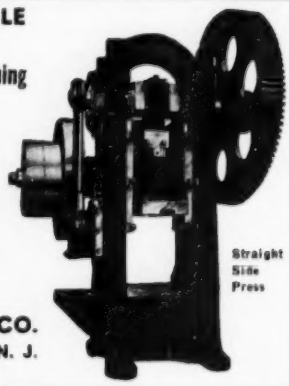

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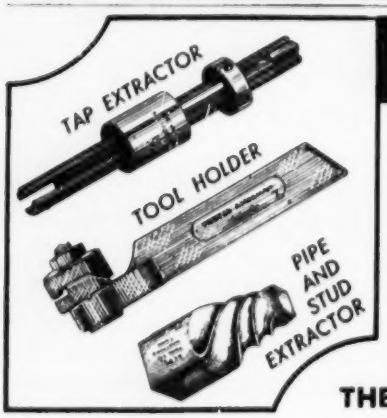

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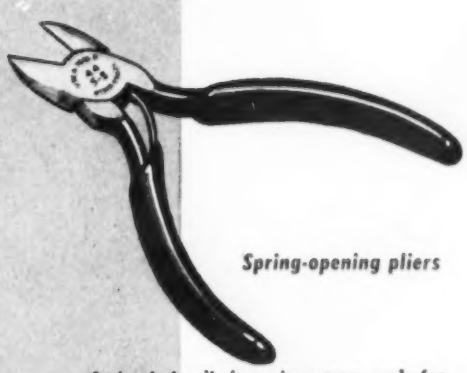

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Spring in handle keeps jaws open, ready for instant use. Greatly reduces hand fatigue on repetitive operations. Spring can be provided separately or in combination with plastic handle and "cushion-throat". Spring for any size pliers, 30¢ extra.

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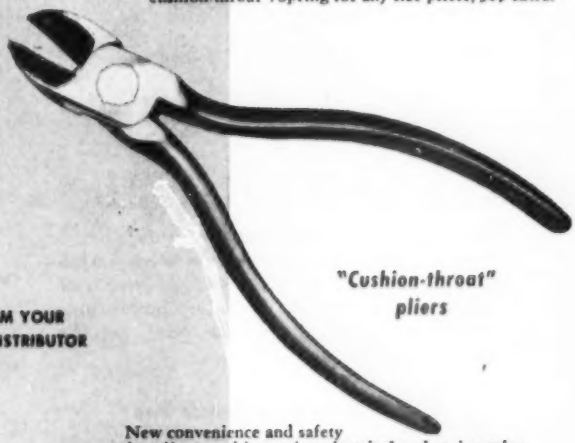

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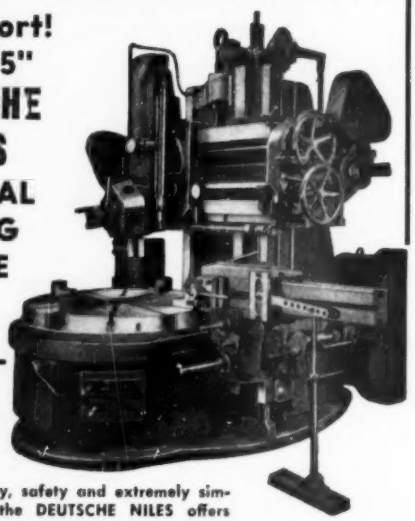

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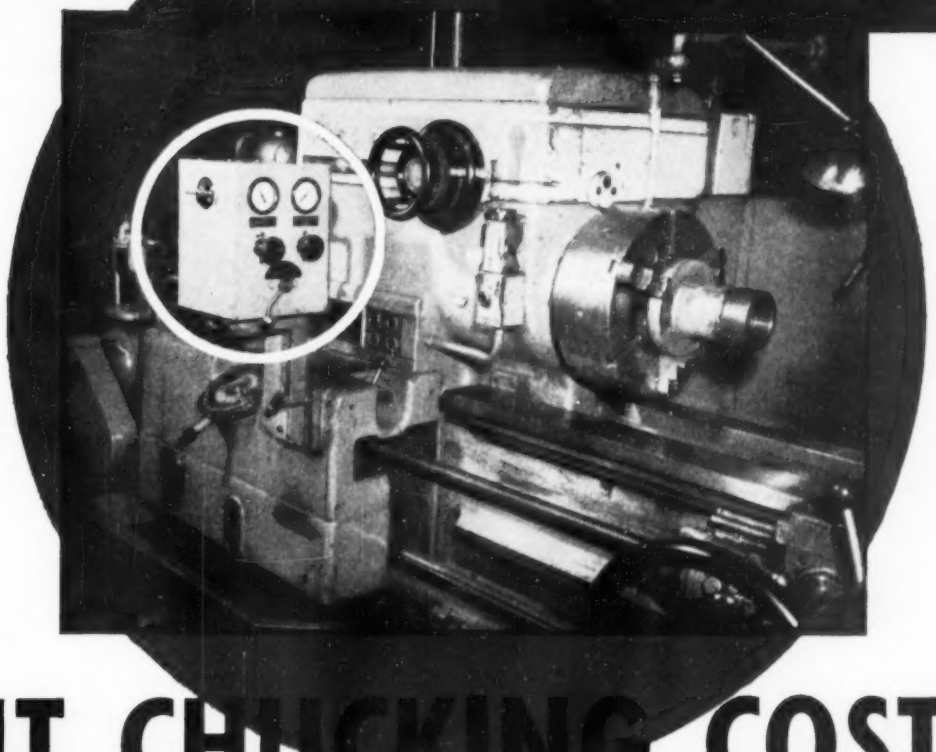

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• TAPPING HEAD
Five sizes of tapping attachments—or a wide range of fixed or adjustable multi-ple spindle tapping heads designed to your specifications—all interchangeable to meet different job requirements.
• WORK HOLDER
Engineered for fastest tapping and handling of the part.

Ettco-Emrick

"UNIT ENGINEERED" 72A TAPPING MACHINE

With this Ettco-Emrick tapping combination—a rigid, sensitive tapping machine—a built-for-the-purpose tapping head—and a custom-built work holder—you can do any tapping job faster, easier and more economically. Its low initial cost and accurate, high-speed work make it a worthwhile investment for any shop, whether for tapping a single hole or thirty holes.

Your local Ettco-Emrick distributor will be glad to give you full information on the amazingly versatile 72A tapping combination. He's in a position to give you sound, expert advice on the best set-up for your needs. Call him in today. If you'd like literature

WRITE FOR BULLETIN 72A

It contains a wealth of information and data on how to use the 72A Tapping Unit to solve specific tapping problems. It's yours for the asking.

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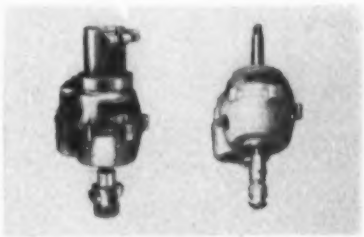
DRILLING and TAPPING EQUIPMENT NEWS

Tool Up Any Drill Press For Fast, Accurate Tapping



Ettco-Emrick tapping attachments can be mounted on any drill press. Newly patented friction clutch provides the delicate sensitivity needed for high speed tapping or threading. 7 different models for No. 6 to ⅝" dies and for No. 0 to 1" taps. *Details in Bulletin No. 22. Write Ettco Tool Co., 590 Johnson Ave., Brooklyn 37, N. Y.*

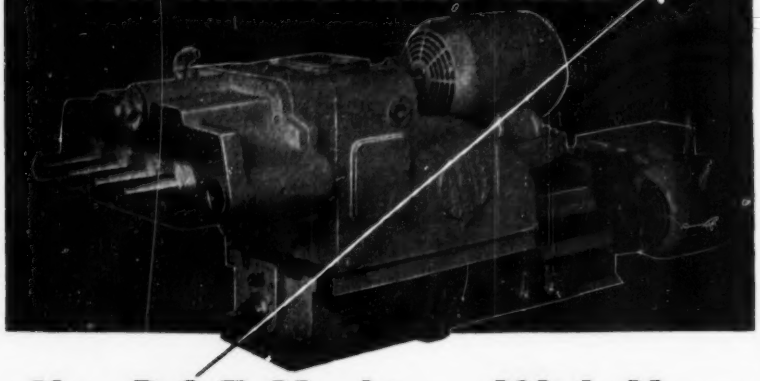
Balanced Tap Chuck Insures Greater Accuracy

Balanced construction of this newly designed precision-made Ettco-Emrick tap chuck eliminates "whipping" action and insures greater accuracy. Light weight and small external dimensions minimize spindle inertia on reversing, making it suitable for either light, sensitive work or heavy duty jobs. Sizes available with capacities ranging from No. 0 to 1" taps. *For details, write Ettco Tool Co., Inc., 590 Johnson Ave., Brooklyn 37, N. Y.*

Multiple Tapping and Drilling Heads Offer Big Savings

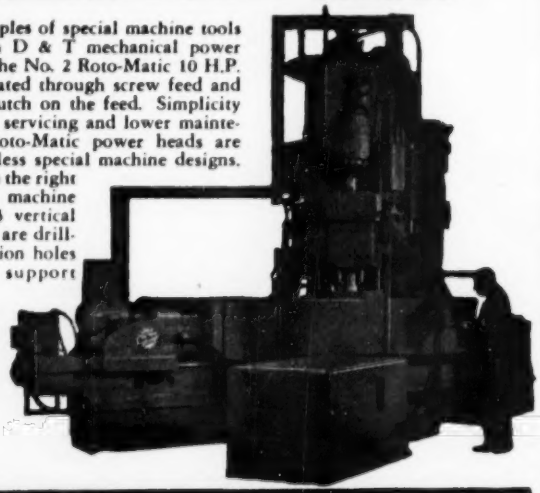
With Ettco-Emrick "Unit-Engineered" Multiple Heads, it is possible to tap or drill from 8 to 30 holes at one stroke on any drill press. Heads and work holders are engineered as a unit to meet shape and hole pattern of part being tapped and to insure fastest handling and tapping. Standardized stock parts keep initial costs low and allow heads to be converted from tapping to drilling or back again in a matter of minutes. *Details in Bulletin No. 3. Write Ettco Tool Co., 590 Johnson Ave., Bklyn. 37, N. Y.*

For High Production and Low Maintenance Costs *



Use D&T Machines With New Mechanical Power Heads

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.



Free Data

is available on the complete line of D & T machines. Ask for Bulletin 1000.

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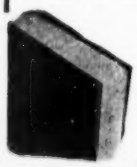

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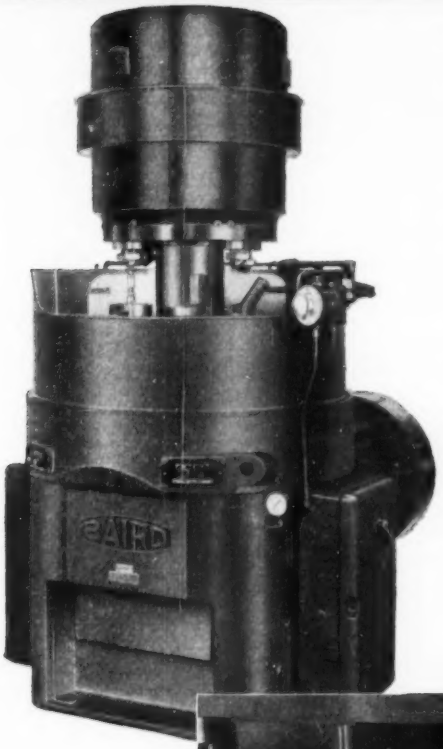
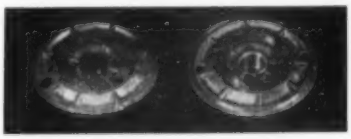


TOOLS MOVE HORIZONTALLY, OTHERS VERTICALLY, FOR FACING . . . TURNING

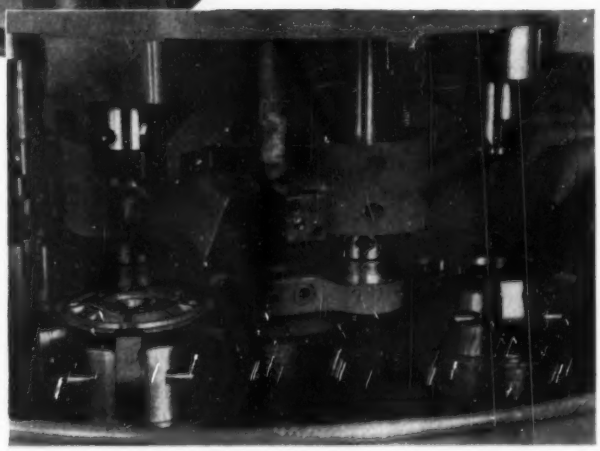
. . . and that's but one of the excellent features of Baird's No. 54VC (5" chuck, 4-spindle, vertical continuous lathe). As the turret revolves, eliminating unproductive indexing time, holding fixtures grip and release automatically for easy loading and unloading. Tools feed in and out of the cutting stroke.

This typical Baird tooling set-up bores the hole, faces and chamfers the hub, and turns the flange of a generator end plate. Cycle time 19.48 seconds, 5 seconds per piece, 720 per hour. Feed: boring hole and facing hub .0039" . . . turning flange .005" and .002" (forming tools). Cutting speeds: boring 348 ft.; turning 1985 ft. per minute.

Safety for operator and prevention of machine and product damage are mechanically and electrically controlled; tools cannot feed to work unless spindles are revolving; electrical equipment is enclosed, wiring concealed.



BEFORE AND AFTER



(Above) Front view, showing splash guards for wet cutting.

(Right) Tooling set-up for finishing a generator end plate.

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1. Compact design.
2. Easy to tool and operate.
3. Simple . . . dependable.
4. Extremely accurate.
5. Unusually versatile.
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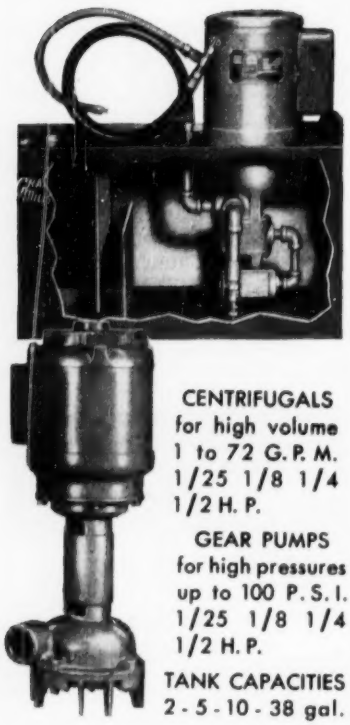

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4	32-48-80-64
5	36-32-36-48-80
6	36-40-48-56-80
7	32-40
8	24-30-36-38-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	20-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	18-24-26-27-30-32-36-40
5/16	16-20-22-27-28-32-40

SIZE	THREAD
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-16-20-24-26-27-28-32
13/16	10-14-16-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	18-20-24
1-5/8	5-1/2-8-10-12-13-16-20-24
1-11/16	10-12-14-16-18-20-24

SIZE	THREAD
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24-28
2	4-1/2-8-10-12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-1/2-8-12-14-16-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	16
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-7/8	8
4	8-12

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-48-48
5	40-44
6	32-36-48
8	32-36-48
10	24-30-32-48
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32

SIZE	THREAD
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-18-20-24
11/16	11-16-24
3/4	10-16-18-20
13/16	16
7/8	9-12-14-18-28
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18

SIZE	THREAD
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
1-11/16	8-10-12-14-16-18-20
1-3/4	8-10-12-14-16-18-20
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
2	4-1/2-10-12

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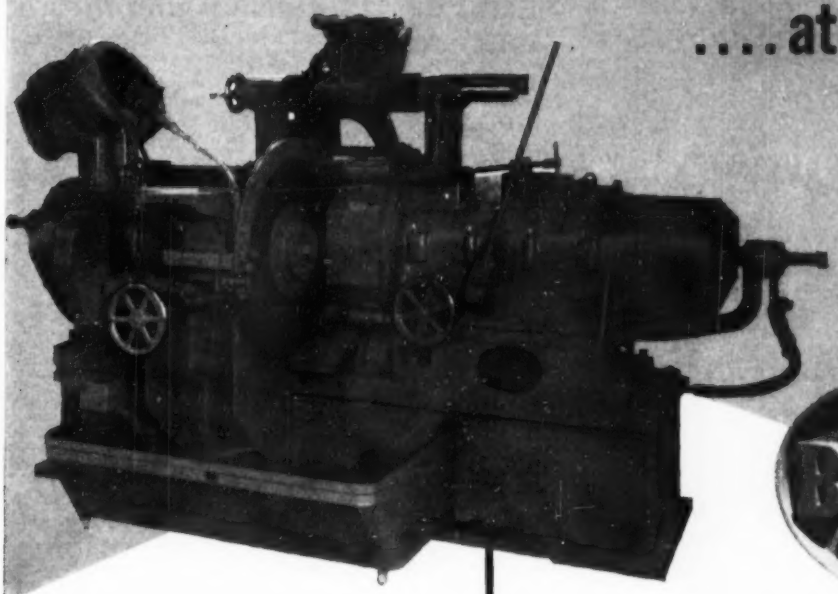

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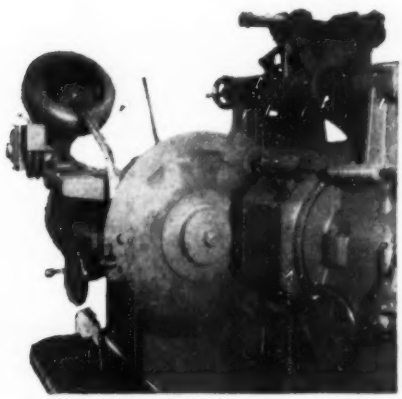

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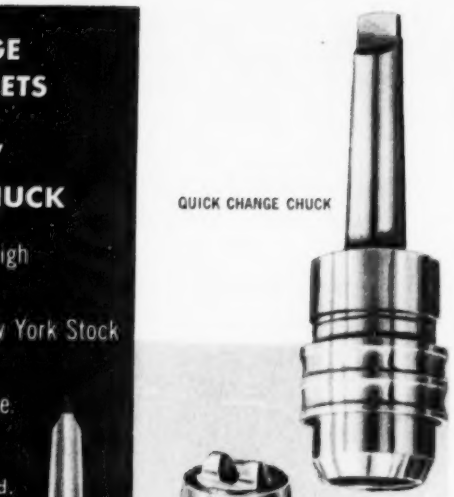

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Our hand operated bench type cutters are made in three handy sizes. By simply changing blades you can cut angles, channels, flat bars, rods, and wire rope.

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Capacity: 7/16" hole through ¼" steel or equivalent. Weight: 70 lbs.

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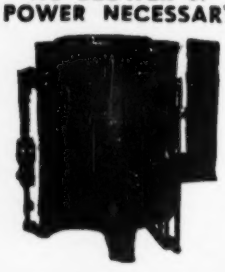

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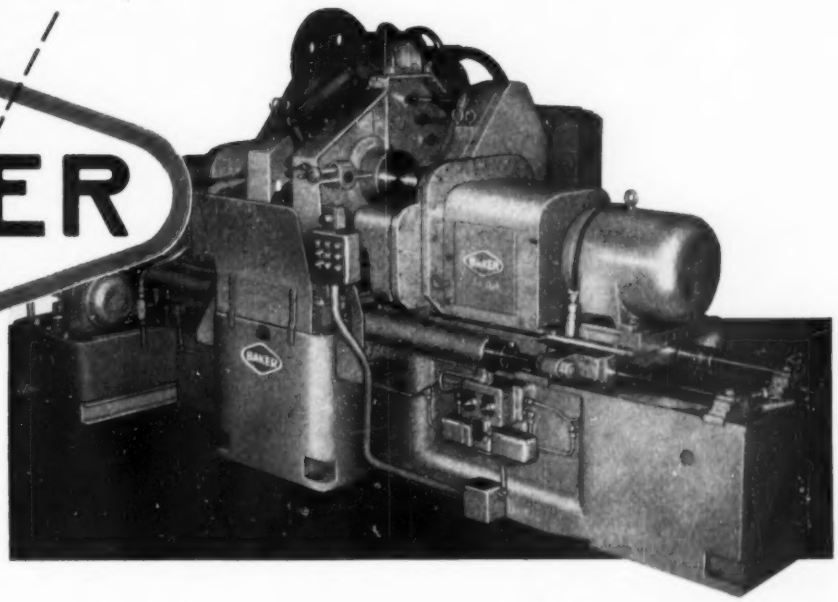

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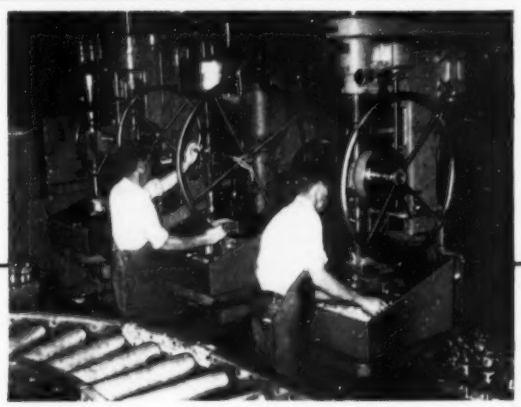

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MODEL 7P

WALTHAM SUB-PRESSES...

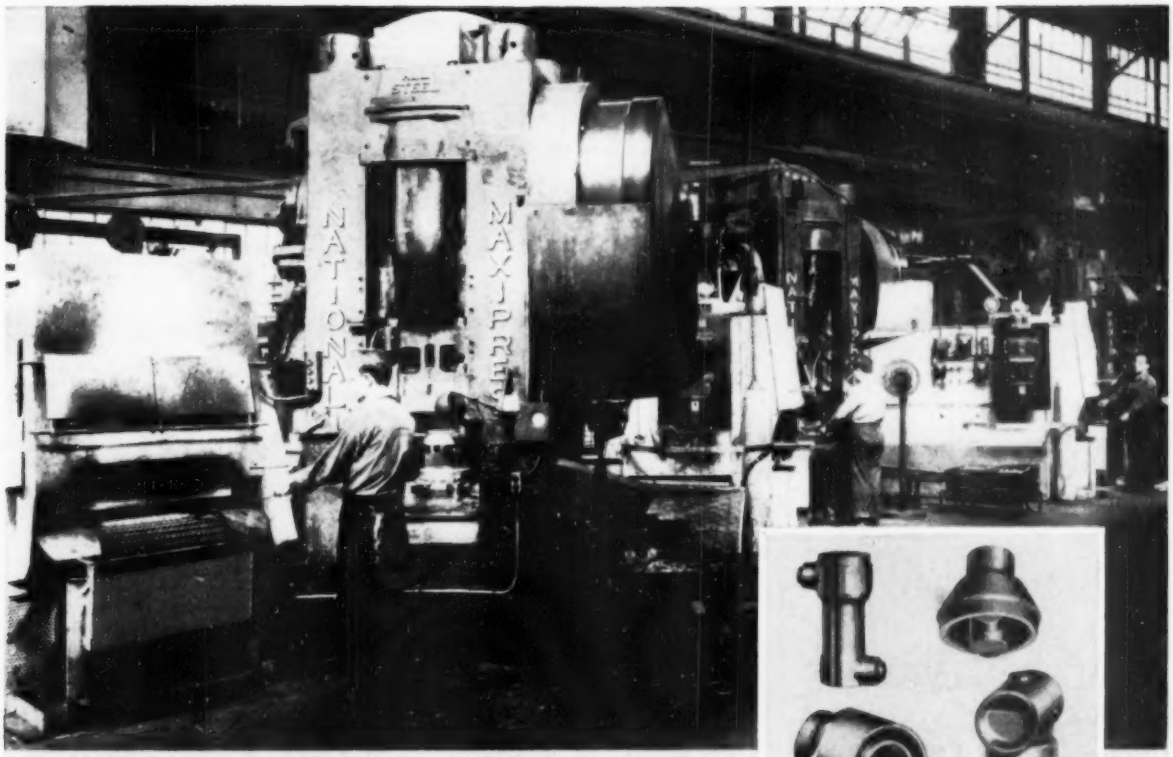
. . . for precision work

Arch Sub-Press

The cylindrical plungers in the Waltham Sub-Presses slide in babbitted bearings. This bearing is tapered on the outside and can be forced downwards, thus reducing the inside diameter to fit the plunger when the latter becomes worn through use. Exact alignment and constant precision can be maintained throughout the life of the die. Write for information about the nine sizes.

Overhang

WALTHAM MACHINE WORKS
HIGH STREET, WALTHAM, MASS.



MAXIPRES forging operations at Titan Metal Manufacturing Co., Bellefonte, Pa.

Typical Titan forgings. Note intricate designs.

3600 TITAN Forgings Per Hour

. . . from this battery of

HIGH SPEED FORGING MAXIPRESSES!

Titan Metal Manufacturing Co., Bellefonte, Pa., specialists in quality brass and bronze forgings, is achieving outstanding production rates with this battery of three National High Speed Forging MAXIPRESSES, which reach 1,200 forgings per press per hour!

Titan forgings, many of intricate shapes with thin wall sections, vary in weight from less than one ounce up to 100 lbs. They are precision forgings, due in part to the over all ruggedness and built-in rigidity of the MAXIPRES.

If you have a forging problem—large or small, hot or cold—ferrous or non-ferrous—let us help you solve it. Send us prints, or a sample part, or, better yet, visit us. No obligation.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO—SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

#2 IMPERIA universal tool and cutter grinder

immediate delivery

Swing over table 10"
Distance between centers 20"
Surface of table 5" x 32"
4 spindle speeds, r.p.m. 2900 to 5800

Thousands in use all over the world. Many in this country where they may be seen in operation.

write or phone for full details.

Parker Machine Company, Inc.
158 Pioneer St., Brooklyn 31, N. Y.
TRiangle 5-2103 and 2157

---

now . . .

A 48-inch ROTAB

with motor-driven table for fast and easy positioning of work

Now a giant ROTAB!—to give you an extra sized table (48-inch) with benefit of motor-drive to position work fast and easily. The table, with 8 tee slots for clamping work, can be rotated by push of button, and locked to any degree to precision accuracy within 2 min. by vernier graduations. Can also be set from vertical to 30° below horizontal the opposite way. Has one shot lubrication.

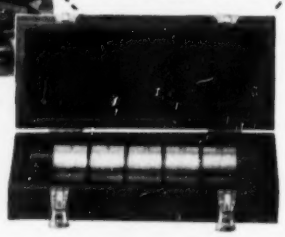
The 36-inch model also available with motor drive. Smaller models—12" and 24"—are set manually.

MACHINE PRODUCTS CORPORATION
6771 E. McNichols Rd. Dept. C Detroit 12, Mich.

Check Surface Roughness Waviness and Lay INSTANTLY

. . . Right At The Machine

With ACME'S ROUGHNESS COMPARISON SPECIMENS



Consists of various surface specimens, *individually finished* to definite micro-inch readings, grouped together in one handy comparison bar. Merely hold bar opposite work for fast, visual comparison check of surface roughness, waviness and lay.

Available in groups of 3, 5 and 8 specimens. Low cost. Write for details, now!

Mfr's. of Drill Jig & Fixture Bushings

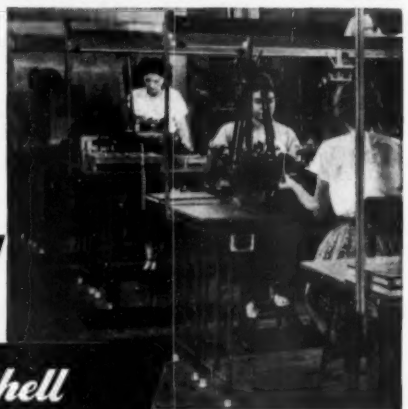
ACME INDUSTRIAL COMPANY

209 N. Laflin St. Chicago 7, Illinois

THE SERVICE SHOP TO INDUSTRY FOR OVER A QUARTER CENTURY

Built to Withstand Hard Use

STRONG RIGID BENCHES For Light Machinery and Assembly



Mitchell PORTABLE ★ FOLDING PLATFORMS

Quick, Easy Set-up

Will support a uniformly distributed load of more than 200 lbs. per square foot without sag or wobble.

Five-ply fir plywood, smooth varnished tops with edge moulding. Tops reinforced with sturdy steel channel. Folding leg assemblies of high carbon tubular steel. Heavy flat steel folding braces. Non-slip rubber feet. All metal parts finished in Bryce Beige durable enamel. Special top sizes and various leg heights available.

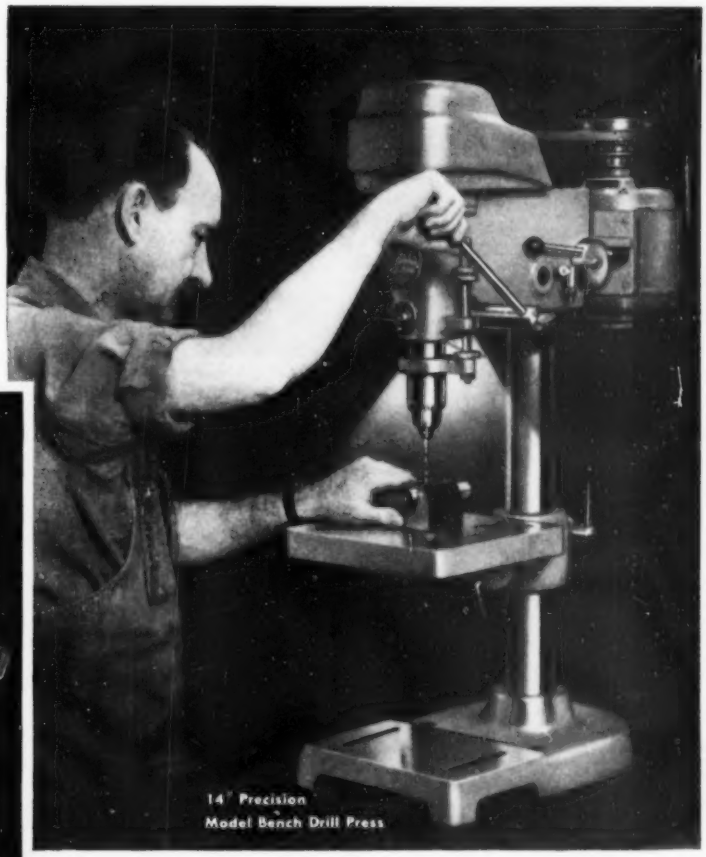
Write for complete information

MITCHELL MANUFACTURING COMPANY
2752 S. 34th STREET • MILWAUKEE 46, WIS.

MFGS. OF FOLD-D-LEG TABLES ★ FOLDING STAGES

SOUTH BEND

Drill Presses



14" Precision
Model Bench Drill Press

Production Model Drill Press

for Efficient Production

14" Economy Model
Bench Drill Press

South Bend precision-built drill presses have many features which help reduce the cost of production machining. Their accuracy and sensitive handling make them ideal for small work requiring close tolerances. And their rugged construction assures long, dependable service on tough jobs. Built with typical South Bend quality and skill, each model is an outstanding value. Choice of Precision, Multiple-head or Economy models. Send coupon for complete information.

14" Precision Model Drill Presses—Drill to center of 14¼" circle. Maximum drill size ½" in iron or steel. Four spindle speeds, 720 to 4325 r.p.m. approx. Belt tension release lever. Spindle run-out .001" max. Spindle square to table within .002" in 5". Balanced pulleys. Built-in shielded light. Free-floating spindle with precision splines. Quill bearing tension adjustment. Four precision ball bearings. Interchangeable spindles.

• • •

14" Economy Model Drill Presses—Capacities and speeds same as above. Spindle run-out .003" max. Spindle square to table within .0075" in 5". Free-floating spindle. Six splines, spindle and drive sleeve. Quill bearing tension adjustment. Four precision ball bearings. Choice of four spindles.

• • •

Production Model Drill Presses—Available in 1, 2, 3 or 4 spindle models. Each head has independent vertical adjustment. Supplied with or without coolant equipment.

Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

South Bend machine tools with accessories may be purchased on convenient terms up to 12 months.

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES

☐ 7" BENCH SHAPERS

☐ TOOL GRINDERS

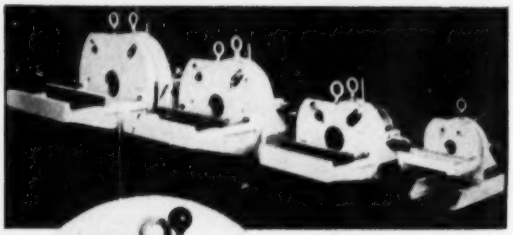
☐ ½" & 1" Collet TURRET LATHES

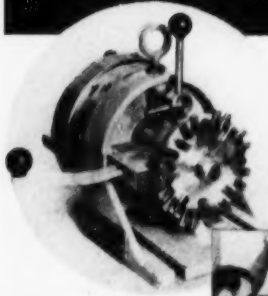
Name _____ Company _____

Street _____ City & State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

NEW Speed Convience





Newly developed STATION SELECTOR now standard equipment on all J&B Table Type Indexing Trunnions. Can also be applied to trunnions already in field. Operator is relieved of responsibility of correctly selecting desired indexing positions. A predetermined pattern of indexing can be set up whereby any or all of the 24 indexing positions can be blocked out.

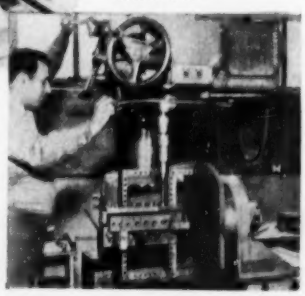


Illustration of a perfect example of the advantages of the J&B Table Type Indexing Trunnion over conventional methods. Notice simplicity of drill jig for drilling all four sides of hydraulic system manifold. Total of 18 holes drilled, 2 holes counterbored, 16 holes tapped in one setup. No need to use air hose. Production greatly increased by faster floor to floor time, rapid indexing, less operator fatigue.

J&B Table Type SUPER-VERSATILE INDEXING TRUNNION

- Simplifies Jig Construction
- Increases jig life by less handling
- Reduces set-up time
- Speeds up production
- Minimizes operator fatigue
- Large pieces handled with more ease than with box jig alone
- Adaptable to all types of production machine tool equipment
- Jig rotation removes chips
- Eliminates abuse to machine table
- Positive dowel pin indexing by 15° increments from 0° to 360° by graduated dial
- Roller Bearing heat treated spindle
- Steel face plate with 90° T slots
- Compact rigid construction plus built-in accuracy
- Built-in Station Selector
- Adaptable for Chuck

ESTABLISHED 1870

JOHNSON & BASSETT INC.

PRODUCTION TOOL DIVISION

Worcester, Massachusetts, U. S. A.

There's a Walker Magnetic Chuck for Every Known Application . . .

For sixty years, Walker has specialized in the designing and production of magnetic holding devices. Today, Walker produces a complete line of magnetic chucks and designs special chucks to meet unusual holding problems.

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Standard Electro and Permanent Magnetic Chucks . . . Vacuum Chucks . . . Special Applications for various holding problems . . . Demagnetizers . . . Magnetic clutches.

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

The 1954 PRODUCTION PLANBOOK for Metalworking, an invaluable new service to you, is coming in November.

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Precision Power Presses and Feeds Since 1889

THE V & O PRESS CO. *Division of Embart Mfg. Co.* HUDSON, N.Y.

ALL TYPES
ALL MATERIALS

BILGRAM BEVEL GEARS

Straight — Spiral Teeth

BILGRAM GEAR & MACHINE WORKS

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Once is not enough!

The need for blood is greater than ever, not only for men wounded in combat, but here at home . . . to cure disease, to meet accidents and disasters, and to prepare for civil defense.

Our quota can ONLY be met, if those who give *keep on* giving . . . regularly!

You CAN give more than once . . . as often as every three months with complete personal safety. The more often you give the more often you save a life. For every pint of blood you give goes to someone who needs it desperately.

Remember . . . once is NOT enough. Give blood again and again! Call your Red Cross, Armed Forces or Community Blood Donor Center for an appointment to give blood today.

GIVE BLOOD

...give it again and again

BUSINESS EXECUTIVES!

CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOOD-MOBILE MAKE REGULAR VISITS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLAN BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . . the need for blood is **urgent!**

NATIONAL BLOOD PROGRAM

FOR MILLING

- STEEL
- CAST IRON
- ARMOUR PLATE
- NON-FERROUS
- STAINLESS

Its Always
8 to 1 Or Better

With the "FUTURMILL" the indexable solid carbide blade milling cutters.

Write for Catalog

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DETROIT MILLING CUTTER CO.

28625 Grand River • Farmington, Mich. • Phone Farmington 1398

Strasmann
1852

PRECISION TOOLS

Milling Cutters • Reamers • Thread Cutting Tools
Surface Grinders • Special Purpose Machines

ALBERT STRASMANN K.G.

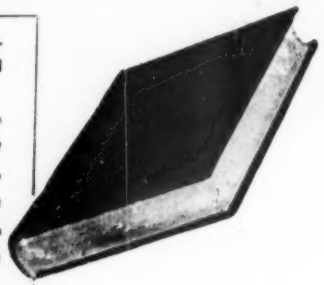
Manufacturer of Precision Tools and Machines
Remscheid-Ehringhausen.

HOW TO GIVE METAL PRODUCTS THE RIGHT FINISH . . .

Here are economical, sales-building methods that produce more attractive products

SUPPLIES UP - TO - DATE INFORMATION ON:

—the techniques involved in metal finishing
—the commercial aspects of metal finishing
—the sales value of attractive finishes
—the economics of metal finishing
—the design of parts which require finishing
—new finishing equipment and processes
—metal finishing costs



HERE'S a manual which demonstrates the vital importance of the finishing process in the final appearance and sales appeal of a product and describes each of these processes in careful detail so that you may achieve an attractive finish as efficiently and economically as modern methods will allow. With special attention to improving results and reducing costs, the book covers all types of finish, such as galvanizing, polishing, plating, lacquering, enameling and painting—wood grain reproduction, chromium plating, and synthetic enamels, and many new finishes of a specialized nature.

FINISHING METAL PRODUCTS

By HERBERT R. SIMONDS
Consulting Engineer

and ADOLPH BREGMAN
Consulting Engineer, Executive Secretary, Masters Electric Plating Association

Second Edition

352 pages, 5¼ x 8¼, 147 figures, $6.00

The revised edition of this highly useful manual describes many new developments, and incorporates the rapid progress in plastics and synthetic resins. Chapters on coloring metal, on costs and estimates and on organic coatings have been added. Answers to every kind of question which arises in connection with the finishing processes are supplied in careful detail, aiming at the most efficient and economical means of achieving a highly attractive finished product with a maximum of selling appeal.

Read this partial list of chapter headings for a few of the important processes and topics described:

- Sales Value of Attractive Finish
- Importance of color
- How to Minimize Cleaning Expense
- Pickling for a Better Finish
- Polishing in Industry
- Designing Products to Reduce Polishing Expense
- Recent Developments in Plating
- Chromium Plating
- Spray Coating
- Electroplating Costs and Estimating
- Synthetic and Novelty Finishes
- Enameling and Lacquering
- Coloring Aluminum
- Porcelain Enamel

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McGRAW-HILL BOOK CO., 330 W. 42 St., NYC 36
Send me Simonds and Bregman's FINISHING METAL PRODUCTS for 10 days' examination on approval. In 10 days I will send $6.00, plus few cents for delivery, or return book postpaid. (We pay for delivery if you remit with this coupon; same return privilege.)

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Position FA-9-28-53

The offer applies to U.S. only

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Many of our clients pay our fee.

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WABASH EMPLOYMENT AGENCY

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FACTORY SUPERVISOR

To have tool and die shop background. For plant under 35, manufacturing name plates, badges and marking products.

P8226 AMERICAN MACHINIST

520 N. Michigan Ave., Chicago 11, Ill.

MACHINE TOOL SALESMEN

Opportunity to represent nationally known distributor of heavy machine tools in midwest, south and far west.

Send complete resume first letter

SW-9145, AMERICAN MACHINIST

330 W. 42 St., New York 36, N. Y.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

HELP WANTED—Supervisor for machining department of manufacturer in metropolitan New York area to supervise primarily threading department of about twenty men. Most threading machines are of pottstoen make. Experience does not necessarily have to be on such work but applicant should have general machine shop background and possible toolroom experience. Application must include complete detailed resume of experience. P-9077, American Machinist.

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PRODUCTION — METHODS — Process — tooling engineer — thirty year background. Proven executive ability. Available October fifteenth—Salary commensurate with experience and ability—Travel—Relocate. PW-9033, American Machinist.

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AVAILABLE: SALES Organization with National Distribution on Inspection Equipment can handle additional products. Only first-class equipment desired as all of our representatives are In pection specialist. Give complete information as to products available, technical data, present distribution, etc. Write RA-9243, American Machinist.

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18 years Design, Planning, Tooling; Diesel Engines, Fuel Injection Gear; Gas Turbines; Castings; Aircraft and Marine components. 10 years Supervisory positions. London trained, travelled U.S., present location Ontario, Canada. Responsible position required—preferably New England. Available at 30 days. Full resume:

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330 W. 42 St., New York 36, N. Y.

AVAILABLE — CHIEF DESIGNER

Twenty-five years experience. Successful household appliances, industrial electromechanical devices, aircraft actuators, synchros, servo motors. Administrative ability.

PW-8981, AMERICAN MACHINIST
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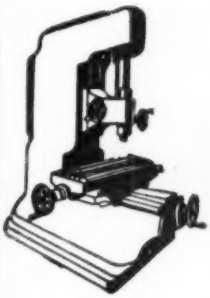

SEARCHLIGHT Equipment Spotting SERVICE

This service is aimed at helping you, the reader of AMERICAN MACHINIST, locate used and surplus new metalworking machinery and equipment not currently advertised. (This service is for user-buyers only.)

Just send in the specifications of the equipment wanted on the coupon below, or on your own company letterhead, to

Searchlight Equipment Spotting Service
c/o American Machinist
330 W. 42nd St., N.Y. 36, N.Y.

Your requirements will be brought promptly to the attention of the used equipment dealers advertising in this issue. You will receive replies directly from them.

NO CHARGE • NO OBLIGATION

Searchlight Equipment Spotting Service
c/o American Machinist
330 W. 42nd St., New York 36, N. Y.

Please help us locate the following used equipment:

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9-28-53

• LATHE CHUCKS •

• COMPARE THESE PRICES •

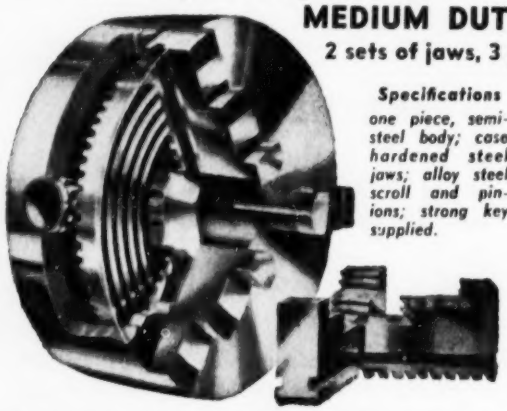
ACT QUICKLY WHILE OUR STOCK LASTS

BRAND NEW • ABSOLUTELY GUARANTEED

• RUGGED CONSTRUCTION

IMMEDIATE DELIVERY FROM STOCK

These lathe chucks, manufactured in England are equivalent in all respects to chucks selling here for two and three times the price. All are absolutely guaranteed with respect to accuracy, workmanship, and strength.



MEDIUM DUTY 3 JAW UNIVERSAL CHUCKS

2 sets of jaws, 3 pinions, for use with intermediate backplate.

Specifications

one piece, semi-steel body; case hardened steel jaws; alloy steel scroll and pinions; strong key supplied.

Size	Weight	Price	Price Soft Jaws
2¾"	2½ lbs.	$ 25.00	$ 5.00
3¼"	3½	26.50	6.50
4"	6½	30.00	7.50
5"	12	37.50	9.00
6"	17½	45.00	10.00
7½"	29	57.50	13.50
9"	42	67.50	15.00
10½"	62	95.00	20.00
12"	88	125.00	22.50
15"	143	175.00	25.00
18"	200	250.00	35.00
24"	324	325.00	45.00

Steel body chucks are also available in some sizes.
Soft jaws and spare parts are immediately available from New York stock.

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SAVE AT LEAST

40%

ON THE COST OF

BLANKING PUNCHES

• We are now equipped with the latest type of punch making machines. Prompt service given on all orders. Size limit is 4½"x5½" in height with no limit as to shape. Send your drawings for quotations. We furnish any available die steel as per your specifications—or you may furnish the blank. All work guaranteed according to your drawings.

MICHEL MANUFACTURING CO.
227 N. Water St., Milwaukee 2, Wis.

WANTED

1-STORY PLANT OF 50,000 SQ. FT.

Equipped and operating, having large planers, also horizontal boring and milling machinery, with crane facilities up to 25 tons. Prefer location in East.

W-9180, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

WANT TO BUY

One 12", Type "D" Bullard "Mult-Au-Matic" arranged for double index, with at least 2 double purpose heads and 2 compound heads.

Contact LOUIS WOZAR or KENNETH LUNG
THE DAYTON PUMP & MFG. CO.
DAYTON 1, OHIO
Phone: MI-9871

CAN YOU USE HELP ON PRODUCTION TURNING?

Manufacturer has open time available in chucking department, on automatic turret lathes and eight spindle Bullard mult-au-matics.

Send prints for estimates or comparison on present costs.

CW-8339, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

MACHINERY WANTED

1 Monarch engine lathe 12 inch swing with minimum 3 feet between centers.
1 Monarch engine lathe 16 inch swing with minimum 4 feet between centers.
Must be less than 3 years old and comparable to new equipment.
1 Gould and Eberhardt Hobber 24 inch.
1 Gould and Eberhardt Hobber 36 inch.
1 Gould and Eberhardt Hobber 48 inch equipped with differential and preferably with tangential feed.
Must be in excellent condition. Write giving serial # age and price.

W-8864, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

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10 to 12 ft. Lengths
ALL METALS
Also special screw machine products to order
EASTERN MACHINE SCREW
20-40 Barclay St.
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Makers of
H & S DIE HEADS

PATTERNS in WOOD and METAL
for All Kinds of Castings Large or Small
MATCH PLATE WORK A SPECIALTY
GENERAL PATTERN WORKS

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that other readers of this publication can supply

OR—

Something you don't want

that other readers can use advertise it in the

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Every Item Guaranteed as Represented

AUTOMATIC, #0 B & S Wire Feed Screw, Late.
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AUTOMATIC, 00 Brown & Sharpe HI Speed, M.D.

BALANCER, Andersen Bros. 14"x54", Rota-Checker.
BORING MILL, 36" Bullard M.D., V.T.L.
BORING MILL, 2¼" Lucas Horiz. M.D.
BORING MILL, Lucas Horiz., 3" Bar, M.D.
BORING MILL, Giddings & L #0 Horiz. 3½" Bar.
BORING MILL, 100" Niles B-P M.D. 2 swivel hds.
BARRELS, Tumbling Lupomatic, Schutte & Koerting.
BRAKE, #335 Chicago, M.D., Press, 6' 13 ga., NEW.
BRAKE, #185 Chicago Power Apron, 8'x3/16" cap.
BROACH, La Pointe 5 ton, 36" stroke, #1 Late.

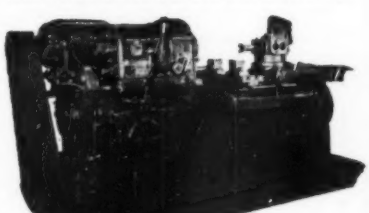
COMPRESSOR, Ingersoll Rand ER-1, 10 HP, M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
COMPRESSOR, C-P 50 HP, M.D., 10x10, 278 CFM.
CRANE, OET Ricker 2 tons 11'9" span.
CRANE, Canton #8 Portable Gooseneck 3 ton cap.

RADIAL DRILL, 3' 9" Mueller, M.D.
RADIAL DRILL, 3'x11" Canedy-Otto, M.D., Late
RADIAL DRILL, 4'x11" Cincinnati Bickford, M.D
RADIAL DRILL, 5'13" Cincinnati-Bickford, M.D
RADIAL DRILL, 6'x15" Cincinnati-Bickford, M.D
RADIAL DRILL, 30" Walker Turner M.D., Late
DRILL, Fesdick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2 M.D.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 16"
DRILL, 6 Sp., Avey 12" overhang, #3 M.T., M.D
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, Nateo Multiple Spdle C5, 10 Sp. M.D.
DRILL, Nateo Multiple Spdle #12, #1 M.T., M.D
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4
DRILL PRESS, #2MS Buffalo Forge single spindle
DRILL, Barnes, 24" S.S. #4 M.T., 1¼" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #3 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40 below zero.
DEMAGNETIZER, SB-911 Magnaflux, late type.

FACING HEADS, 20" & 24" Mummert-Dixon.
FILER, #11-S Cochrane Bly Auto Saw Filer.
FILER, Type P4 Oliver Floor Type, M.D.
FURNACE, Westinghouse Elec. 18 KW, 2100° F cap.

GRINDER, M.D. Sanford Surf. 8"x12" cap., New.
GRINDER, #1 Wilmarth Merman Hand Surf., 6"x12".
GRINDER, #2 Imperia Univ. Tool & Cutter, New.
GRINDER, #2 Brown & Sharpe Sur. 6"x18" cap.
GRINDER, #2 Cincl. Centerless Filmatic, Late Type.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #205, 16" Dble End.
GRINDER, Heald Rotary #25, M.D. 16" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Thread, Jones & Lamson #TG-615, Late
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Surf.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, Oliver Auto. M.D. Drillpointer, #51.
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4½".
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late
GRINDER, #60 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 37" Wheel Dia. Osterheim Diss. 24" cap.
GRINDER, 30" Ingersoll Tub Face Mill, M.D.
GRINDER, #79, 72" Gardner Vert. Spindle, Late.
PROFILE GRINDER, Studer Type P&M, M.D., late
GEAR LAPPER, #6LS, #13LSI Fellows, Outboard Supports, Detachable Laphead, Late.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.

HAMMER, Rochester Hispeed, all sizes, M.D.
HAMMER, Bradley 200# Rubber Cushioned Helve
HEADER, Manville #1 S.S.D.D. Cold 3/16".
INDUCTION HEATER, 16 KVA Ecco HI Frequency.

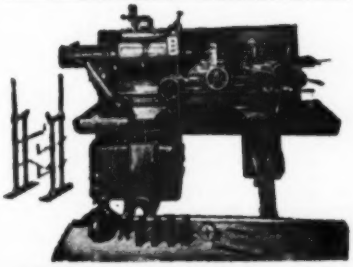


4DE POTTER & JOHNSTON Automatic Turret Lathe, Motor Driven, T.E.F.C. 7½ HP. 3/60.220/440.

INDUCTION HEATER, 30 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW
HONE, #194 Barnes Vertical, M.D., Hyd. Late.

KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

No. 7 BARDONS & OLIVER Geared Head
Full Universal Turret Lathe, Preselector Head. Bar Feed, 4" capacity through spindle Late Type, Motor Driven.

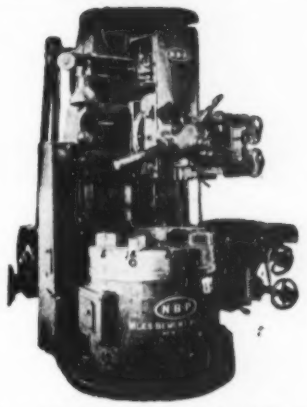


#2 WARNER & SWASEY Geared Head Turret Lathe, 12 Spindle Speeds, Bar Feed.

LATHE, Lo-Swing 8"x108", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 8"x15" Geared Head Prod.
LATHE, #6 WSL Reid Smallpiece Prod., Late Type
LATHE, LoBlend 14"x8', Q.C.G., M.D.
LATHE, Handey 14"x8' Q.C.G. Taper Attach. M.D
LATHE, American 18"x8' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D
LATHE, Road-Prentice 20"x10' Grd. Hd. M.D.
LATHE, LoBlend 22"x10' Q.C.G., M.D.
LATHE, 24"x10' Axelson Grd., Late, M.D.
LATHE, 24"x12' Boye & Emmes Grd. Hd., T.A., Late
LATHE, Putnam 25/32"x12' Q.C.G., M.D.
LATHE, LoBlend 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, 27"x16' Niles Timesaver, Grd. Hd., M.D
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, 42"x10' Pittsburgh Geared Head, M.D.
LATHE, Bullng Dble. End #VMT5, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret #2 W & S Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½"
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cincl. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
LATHE, #60I Oster Hand Turret, M.D., Late Type.
LIFT TRUCKS, 1 & 2 ton, Platform & Fork.

MILL, #1-14 Kent-Owens Hyd. Late Type.
MILL, No. 1 U. S. Hand Mill, M.D. Late.
MILL No. 1½ Milwaukee Plain Horiz.
MILL, #4 Burke Motor Driven, Late, M.D.
MILL #0-8 Cinc. Vert. Prod. Rotary Table
MILL, 2M Cincinnati Univ. Horiz. M.D.
MILL, #3B Brown & Sharpe Vertical, M.D.
MILL, #3VB Hardinge Vert. Bench, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cincl. Horiz. #3, #4, #5 High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #6-8 Cincl. Vert. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-6 Auto. Prod.
MILL, No. 0 Brown & Sharpe Plain Horiz.
MILL, #0 Douglas Plain Horiz. M.D., Coolant.
MILL, #0 Sundstrand Rigidmil Hyd. Late Type
MILL, #0 Vernon Hand Mill, M.D., Late.
MILL, #2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LoBlend #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cincl. Vertical HI Power, M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILL, 42"x96"x12" Ingersoll Planer Type, 4 hds.
MILLING MACHINE, #2 Van Norman Duplex, M.D
MOTOR GENERATOR SET, Gen. Electric, 100 K.W
NIBBLER, #136 Savage 36"x5/16" Cap., M.D.
NAILING MACHINE, No. 16—48"-54" Morgan, Late.

THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Plan-O-Mill #5 Planetary Form & Thread Semi-Automatic Milling Machine, Late



16" x 44" Niles Vertical Boring Mill, Side Head, Motor Driven.

#40A Lees-Bradner Automatic Chucking Thread Mill, Motor Driven, Late Type.

PAPER SHREDDER, No. 10 Mitts & Merrill, M.D
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x20" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, D72 & D673 Ferracute, Redraw, M.D.
PRESS, #2½ & #6 Toledo, OBI, Motor Driven.
PRESS, #5 Johnson OBI, 56 tons, new.
PRESS, #7 & #8 Johnson OBI 79 & 90 tons, New.
PRESS #24 Walsh OBI 24 tons cap., Late.
PRESS, 70H & 125PA Drake Hyd. Arbor, New.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 66 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #66 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
WHEEL PRESS, 600 ton Niles Bement Pond, A.C.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1⅝" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".

RIVET BETTER, ⅝" cap. Penn. Tubular Rivet.
ROLLS, Bertsch Pyramid 18"x1⅝" cap., M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, 72"x1¼" Lown Initial M.D., New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #780, 48" dia. blade, M.D
CUT-OFF SAW, Radius "U" DeSanno.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW #8 Marvel Bandsaw, 18"x18" cap.
SAW, #4B Marvel Hack Saw 6"x9" Cap., M.D.
SAW, #20-C Racine Shear Cut 6"x8" cap., M.D.
SAW, 10"x10" Racine Hydraulic, Late Type, M.D. #30C.
SAW, Band Tannewitz GH-36" High Speed, M.D.
SAW V-26 DeALL Bandsaw, Late.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cincl., B.G., Motor Driven, M.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 6' x 14 ga. Parker M.D., Late Type.
SHEAR, #26 Buffalo Forge Slitting Armor Plate
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical M.D.
SPOTTER & SCRAPER, Anderson Power Unit, Late.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 Cam Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
THREAD ROLLER, #20, #30 Waterbury Farrel, Late.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model QT-20
TRUCK, 4000 lbs. LT-44 Towmaster Fork, Lift 9'.
BRINELL TESTER, Type 03DR, Steel City.
WELDER, 500 amp. Westinghouse Flexors A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 75 KVA Federal M.D., Spot.
WIRE STITCHER, Morrison & Acme, M.D.

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5/16" No. 71 Ettco, (two)
Greenley, 3 way special, (two)
20" Hammond sensitive drilling and tapping machine
Model D6 Natco multiple spindle tapper

BROACHES

5 ton, 40" Foote Burt duplex surface
10 ton, 56", No. 3XA Oilgear
10 ton, 48", No. H10 48 American
12 ton, No. V2 American vertical
15 ton, 36" Colonial vertical surface
18 ton, 42" No. V12 American

MILLERS

No. 1 Milwaukee vertical, all geared, friction clutch
No. 2B Milwaukee universal, double overarm, power rapid traverse
No. 2 Cincinnati high speed dial type plain, motor in base, 6 way rapid traverse
No. 3K Kearney & Trecker vert., 1943 high speed dial type
No. 3K Kearney & Trecker univ., high speed dial type
No. 36 Van Norman, ram type, 1943, high speed dial type
No. 436 Cincinnati Hydromatic
No. 448 Cincinnati Hydromatic duplex

COMPLETE MACHINERY SERVICE

GEAR CUTTERS

Type A & No. 12 Barber Colman
Nos. 1 & 5A Lees Bradner
No. 12H Gould & Eberhardt
16" Cincinnati hobber
24", No. 3 Farwell hobber
No. 130 Cleveland Rigidhobber
72" Schuchardt & Shutte hob
4" Gleason spiral bevel
No. 13 Gleason gear tester
10" Pratt & Whitney gear grinder
8" & 12" Red Ring gear shavers
24"x12" Flather auto. spur
Cimatool tooth rounders

GRINDERS

No. 2 Cinni. centerless, pressure, lubrication
10"x18" Cincinnati Filmatic bearing type ER plain, cylindrical, New 1941 and 1942
10x18 Norton type BA plunge cut
10x36" Norton type B. semi-automatic hydraulic infeed, cylindrical
12"x48" Cincinnati E.R. Universal, Filmatic
20" No. 120A Gardner disc, new in 1947, double spindle
No. 5 Bryant internal, new in 1945
No. 72A3 Heald plain Sizematic & Gagematic
Nos. 16A and 2436, Bryant
8"x24" No. 5B B&S, late model, surface
12"x48" No. 300 Hanchett Vert. Spindle Surface, 1942

MONEY BACK GUARANTEE

LATHES

14"x42" Hendey 12 speed toolroom, Motor-in-Base, Late.
24"x14 ft. bed American geared head quick change gears
20"x25" Fay automatic, 1942
12"x24" Lithe Carbo-lathes, late type, 3
2—No. 6 R. K. LeBlond multi-cut manufacturing, 1941
No. 3A Warner & Swasey, serial No. 502273 new in 1943, rapid traverse, Timken bearings, long bed
No. 6 Warner & Swasey geared head motor in base
36" Rogers vertical turret, new in 1942, power rapid traverse
36" Bullard, New Era, rapid traverse, rebuilt

MISCELLANEOUS

OIL EXTRACTOR. No. 501 Barrett
ROD POINTER. Type KK Economy Auto.
BORING MILL 3½" Cinni-Gilbert, floor model, 1942
BORING MILL. 4" D. & H. floor type
BORING MILL. 72" N.B.P. vertical
COMPARATOR. 20" Portman
HONES. Nos. 172 & 2610 Barnes
KEYSEATERS. No. 4 Mitts & Merrill
PLANER. 30"x30"x10' Cincinnati
PLANER. 36"x36"x10' Niles Bement Pond

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Look here -- at these Botwinik Buys!

Bullard Model "D" 16"-23" Mult-Au-Matic—8 spindles—single indexing—MD—Late type
Cincinnati 72" x 54" x 16' Hypro Planer Mill—Infinite variable speeds—2 rail and 2 side heads—MD

BORING MILLS—HORIZONTAL

(NEW) Model V-90 Table Type—3½" bar—long feed 44⅛"—Vertical feed 31½"—Table 33½" x 39¼"—MD
(NEW) Model AF-95 Table Type—3¾" bar—Long feed 47¼"—MD

BORING MILLS—VERTICAL

Bullard 24", 36" and 54" "Spiral Drive"—Side heads—MD
(NEW) TV-2100—72" table—2 swivel heads and side head—MD
Niles 100"—2 swivel heads—54" under tool holders—MD
Niles 12'—2 swivel heads—148" between uprights—MD

GEAR CUTTERS

Gould & Eberhardt 96" x 30" Automatic Spur & Helical—Auxiliary table—Power feeds—MD
Pfauter #5—Gap. 118" x 22"—Spur, Helical & Worm with attch. for herringbone—MD

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Yoder 14" stand, 24" wide, 2½" dia. shaft, 25 H.P. M.D.
Tishkin M-2 Ton stand Yoder with AC-2 Cutoff.
Rafter Tube Forming Machines, 5 & 7 Stand.
Yoder 5 stand vertical, with AC-1 Cutoff.

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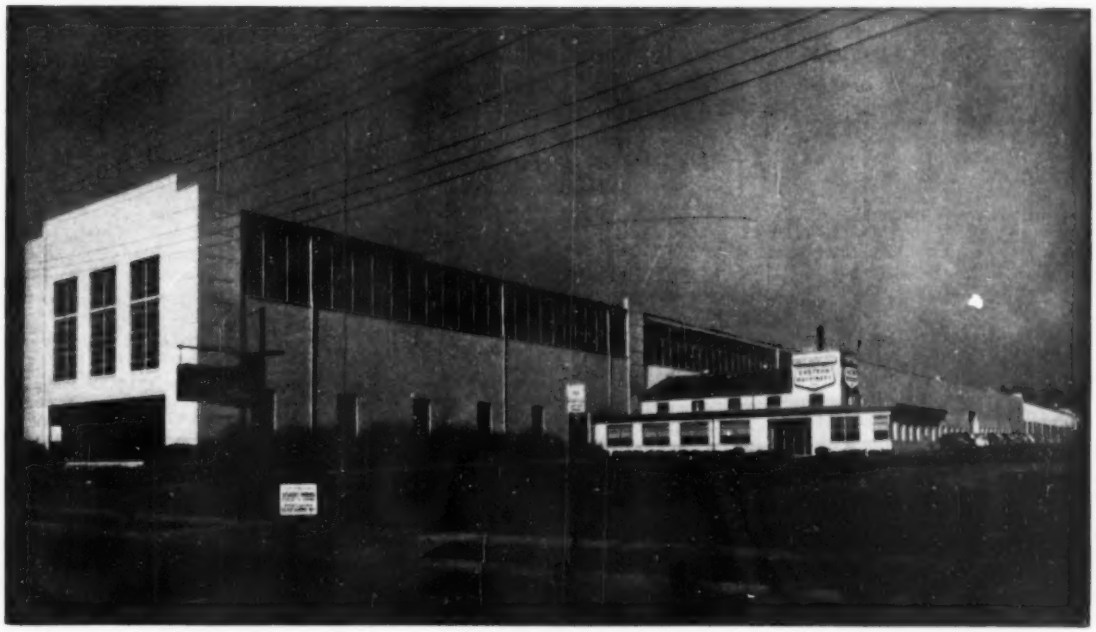

MULTIPLE SPINDLE DRILLS

#115U Moline Multiple Spindle Drill Press
Foote-Burt 3 spindle Staybolt Drill
C13 Natco, m.d., 16x24" rect. head
No. 3 Baush, m.d., 16x30" head
No. 3 Baush, m.d., 20x40" head
No. 16 Foote-Burt Fixed Center, m.d.
3 spindle Rockford Gang Drill, m.d.
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 28" Cinti. Bickford Upright Drill, m.d., No. 4 Morse Taper
4 spindle Niles-Bement-Pond, m.d., 12' rail, No. 5 Taper
No. 924 W. F. & John Barnes Vertical Drilling, Boring, Facing & Reaming Machine, m.d.

UPRIGHT DRILLS

D6 Colburn Heavy Duty, m.d.
21" Cincinnati, belted m.d.
24" Aurora, belted m.d.
24" Cincinnati-Bickford, m.d.
24" extended to 36" Cincinnati-Bickford, m.d., upright sliding head
26" Aurora, m.d., taper
32" Aurora, belt drive
36" Cincinnati-Bickford, belt drive
No. 2 Colburn Mfg. Type, belted m.d.
No. 315 Baker Heavy Duty, s.p.d.
No. 417 Baker, m.d., later type
No. 513 Baker, m.d.
#4—48" Defiance Machine Co. Drill, m.d.
No. 16 Foote-Burt Hydraulic Platen Type Single Spindle Prod. Drill, m.d.

GEAR SHAPERS

No. 12 Fellows Gear Shaving Machine, m.d., late
No. 6 Fellows, belt drive
No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 6i Fellows, belted m.d.
No. 6i Fellows, gear box, m.d.
No. 61A Fellows, m.d., latest type
No. 64B Fellows, m.d.
No. 615 Fellows, m.d.
No. 615A Fellows, m.d., late type
No. 64A Fellows, m.d., latest
No. 645 Fellows, belt
No. 75 Fellows, m.d.
No. 712 Fellows, m.d.

INTERNAL GRINDERS

Model 5Y Bryant, m.d.
No. 16—16" Bryant, m.d., Hydraulic Hole Grinder
No. 16—22" Bryant, m.d., latest
No. 16—38" Bryant, m.d., latest
No. 24 P 26" Bryant, m.d.
No. 24—21" Bryant, m.d.
No. 44 Heald Facing Type Borematic, m.d.
No. 72 Heald Sizematic, m.d.
No. 72A Heald Sizematic "Duplex", m.d.
No. 72A Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
No. 74 Heald, m.d.
No. 81 Heald Gagematic, Sizematic, m.d.
No. 649—10" Van Norman Automatic Oscillating Radius, m.d., latest
No. 5 Bryant, m.d., latest
#75A Heald Plain, m.d.

TOOL & CUTTER GRINDERS

Gisholt Universal Toll Grinder, belt
No. 4S Fellows Helical Cutter Sharpening Machine, m.d.
Union Twist Drill & Cutter Grinder
Type 05D Sellers Drill Grinder, m.d.
No. 0-2 GP Sellers Drill Point Thinning Machine, m.d.
Grand Rapids Tap Grinder, style 12M
Gleason Cutter, belt drive
No. 2A Wm. Sellers Universal Tool Grinder, m.d.
No. 2B Sellers Wet Grinder, m.d.
No. 2 Lumsden Oscillating Tool Grinder, belted m.d.
No. 4T Sellers Tool, m.d., latest
No. C-6-A Gallmeyer & Livingston Drill Grinder, m.d.
No. 5T Sellers Tool Grinder, m.d.
No. 1 J & B Tap Grinder, m.d.
Pratt & Whitney Deep Hole Drill Sharpener, m.d., latest
Gould & Eberhardt Gear Cutter Grinder, 2 step cone pulley belt drive

HAMMERS

8000# Chambersburg Steam Drop Hammer

HONING MACHINES

H1 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 6 Barnes Twin Spindle
Model #182 Barnesdrill Hone, m.d., latest
Model 306H Barnes, single spindle

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American 16"x8' bed, 3 SCD, bowl head.
American 30"x10' bed Geared Head, 12 spindle speeds, 2-9/16" hole in spindle, vee belt drive.
Boye & Emmes 20"x10', G.H., complete with taper attachment.
Greaves Klusman 22"x8' G.H. Lathe, complete with taper attachment.
Hendey 20"x10' bed Gearel Head, 8 spindle speeds, 1½" hole in spindle.
LeBlond 17"x8' bed 3 SCD.
LeBlond 27"x10', 3 SCD Lathe, 3'11" centers.
LeBlond 25/50 x 6/10 Sliding Bed Gap Lathe, G.H., Timken bearing.
Lodge & Shipley 14"x5' G.H., single pulley drive, 12 spindle speeds, 20" centers.
Lodge & Shipley 16"x126" centers G.H., Timken bearing, drop lever handles in apron, late type.
Lodge & Shipley 30" x 12' bed G.H., 12 spindle speeds, 62" centers.
Pittsburgh 32"x23' centers Geared head lathe, Timken bearing new 1943.

TURRET LATHES

Acme #2 Full Universal, single pulley drive, hole thru spindle 3½".
Gisholt 1-L Saddle Type Turret Lathe, with bar feed, late type.
Cetar 601 Rapiduction.
Libby International 26" swing x 7½" hole Rapid Production Turret Lathe.
Potter & Johnston 6 DRE Automatic Chucker.

BORING MILLS—Vertical

Betts 100", two heads on rail.
Bullard 42", AC motor drive.
Niles 36"-44", 1 rail and 1 side head.
Niles 42"x50" Driving Box Borer, Burnisher and Facer, motor driven, late type.
42-50 Niles Vertical Boring Mill, one rail and one side head, late.

GEAR MACHINERY

Fellows 612 Spur Gear Shaper.
Fellows 725 Gear Shaper, with spur guide.
Gould & Eberhardt 18-H Hobber.
Gould & Eberhardt 96H Gear Hobber.
Gould & Eberhardt 00BM Gear Rougher.

GRINDERS—Cutter & Tool

Oliver 510 Drill Grinder, new 1942.
Oliver Template Tool Bit Grinder, late.
Sellers 4T Tool Grinder, late type.
Sellers 8T Tool Grinder, late type.

GRINDERS—Internal

Heald 72A3 Plain Internal Grinder, late type.
Heald #78 Centerless Internal Grinder
Micro Internal Grinder, Model F.G.

GRINDERS—Cylindrical

Cincinnati 12x36" Universal, new 1946
Landis 26"x168" centers Plain, arranged for motor drive with motors, 10 speeds 3 to 62.
Landis #2 Universal, 12"x35" centers, belt drive.

GRINDERS—Thread

Jones & Lamson 8x31, late type.

MILLERS—Auto. or Prod.

Hall Style "D" Planetary Mill, late type.
U. S. Multi-Miller, Model 1-S-2, late type.

MILLERS—Plain

Brown & Sharpe #3, 4 SCD.
Cincinnati #3 Hi-Power, single pulley drive.
Cincinnati #4, single pulley drive.
Douglas #0, rectangular overarm.
Milwaukee 2 HL Plain Mill, late type.

MILLERS—Vertical

Brown & Sharpe #2, single pulley.

MILLERS—Universal

Brown & Sharpe 3A, motor in base.
Van Norman #2 SU, late type, working surface of table 12x50; dividing head.

DRILLS—Radial

American 5'14" column, Triple Purpose.
Fosdick 6'15", Heavy Duty Radial Drill.

PLANERS

Pond 48x48x16' Double Housing, DC drive, 4 heads.

ROLLS

Niles 12'x3¼" Initial Type Bending Roll, motor driven with 40 HP motor.

SHAPERS

Averbeck 21" B.G., 4 SCD.
Columbia 28" B.G., gear box drive.
Gould & Eberhardt 20" B.G., gear box.
Gould & Eberhardt 24" B.G., gear box.
Gould & Eberhardt 28" B.G., gear box.
Gould & Eberhardt 32" B.G., gear box.
Potter & Johnston 24" Universal.
Smith & Mills 25" B.G., 4 SCD.

BOREMATIC

Heald #42, late type.

MISCELLANEOUS MACHINERY

H&G Model 1-K Threading Machine, late.
Hobart 200 Amp Arc Welder, late type.
Hoffman Heavy Duty Portable Cleaner.
Speedare 150 Amp Welder, late type.
Taft Pierce Bench Center, 8"x48" centers.

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CINCINNATI MACHINERY CO., Inc.

"GUARANTEED MACHINERY"

3901 KELLOGG AVE. CINCINNATI 26, OHIO

FINE LATE TYPE GUARANTEED TOOLS

28"x15' centers BERTRAM (Niles patterns) "Timesaver" Engine Lathe, 2 carriages, rapid traverse, AC-MD, new 1943.

36"x12' centers AMERICAN Heavy Duty 16 Speed Geared Head Lathe, AC—MD

60"x20' NILES-BEMENT-POND Geared Head Engine Lathe, rapid traverse.

No. 2 WARNER & SWASEY Hand Screw Machine, geared head, power feeds, AC motor in base, Timken spindle.

No. 5 GISHOLT Turret Lathe, Bar feed and Chuck, New 1943.

42" BULLARD, Vertical Boring Mill, extra high column, Serial No. 12938

No. 2 CINCINNATI Vertical Mill, dial type, new 1945

No. 3-24 CINCINNATI Plain Hydromatic Mill, AC-MD

No. 4 KEARNEY & TRECKER Plain Horizontal Mill, No. 50 taper, motor in base, rapid traverse.

No. 4 CINCINNATI Hi-Power Vertical Mill, No. 50 taper, power rapid traverse, AC motor

No. 4H KEARNEY & TRECKER Vertical Mill, new 1944

5" bar KEYSTONE Horizontal Boring, Drilling & Milling Machine, floor type, 14' horizontal travel of column on runway, new 1942.

48"x48"x10' NILES Double Housing Planer, box table, DC reversing motor drive.

48" widened to 69" x 12' DETRICK & HARVEY Double Housing Planer, box table, DC reversing motor drive

No. 2 BROWN & SHARPE Surface Grinder, motor inside base, power feeds.

25A HEALD Rotary Surface Grinder, 24" diameter magnetic chuck, AC-MD.

36" OHIO Dreadnaught Shaper, AC-MD.

1½" LANDIS Bolt Threader, leadscrews, AC-MD.

30" MORTON Hydraulic Keyseater, new 1942

600 Ton CHAMBERSBURG Wheel Press, cast steel frame, inclined, AC-MD

O'CONNELL MACHINERY CO.

629 GENESEE ST. BUFFALO 11, N.Y.

BROWN & SHARPE Automatics (several)
W.F.F. Double Action Power Presses
#08 CINN. Vert. with Rotary Table
30" ESPEN-LUCAS Hydraulic Cold Saw
¼" MANVILLE #1 D.S.S.D. Header
#2A WARNER & SWASEY Turret Lathe
#1 W.F.F. Screw Slotters
10 x 24" HANSON - WHITNEY Univ. Thread Miller
#2 B&S Univ. Grinders, C/S, Tooling
HASKINS #2 Cam Tapper, Index Fixture
#4 TORRINGTON 4 Die Swager
Numerous Other Machine Tools

CURRIER MACHINE SALES
1124 Dixwell Ave., P. O. Box 333
Hamden, Conn.

GUARANTEED MACHINE TOOLS

BORING MILLS, 42" King, Side Hd., New 1942
100" & 72" N.B.P., 2 Hds., M.D.
4" bar Sellers Tble., 90° to outer support
3¼" bar Defiance, Table (2)
RADIAL DRILL, 5'15" col. Amer., Motor-on-Arm
DRILL MULTI, No. W-7 Baush, 32 spin., 1947
GRINDER, CYL., 18"x144" Norton, M.D.
LATHES 72"x38' bed N.B.P., blocks to 97"
48"x29' & 24' beds Niles (2)
42"x28' bed L. & S., T.A., 18 speeds, M.D.
39"/61"x22' McCabe, Double Spindle
18"x12' bed L. & S., T.A., M.D.
SHAPERS, 32", 29", 29", 16" & 14", G. & E.

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ATTENTION EXPORTERS

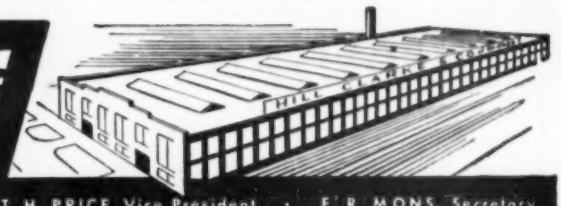
Unusual opportunity to procure modern Fellows Gear Shapers 615A and 645 as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher, #7 Fellows Gear Shaper, #16 D. E. Whiton Machine. Write for full information.

FS-1633, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

MICROMATIC HONE Model H-4
Serial No. 134
New in 1944

WINSTON MACHINERY CO., INC.
326 West Ohio St., Indianapolis 2, Ind.

HILL-CLARKE MACHINERY COMPANY



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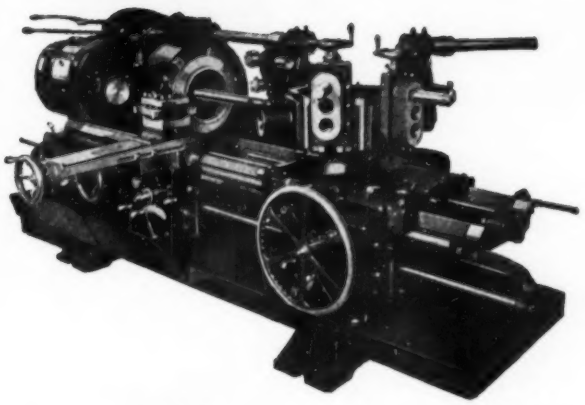

ABOVE:
4-A WARNER & SWASEY
UNIVERSAL TURRET LATHE
7½" Hole Through Spindle
Price: $6750

AUTOMATIC

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl.—14" Sw.—No. 2 Avey Cam Fd.
1 Spdl.—30" Sw.—No. 4 taper Aurora
2 Spdl.—24" Sw—No. 3 Avey
12 Spdl. D-31 Fox, No. 2 Taper

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 36-BM G & E 3 Spdl, Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 64 Fellows Gear Shaper
No. 65 Fellows
8" cap Red Ring Gear Lapper

GRINDERS

6" x 18" Landis (1942)
6" x 18" Norton Cylindrical (1943)
10" x 36" Norton Type C
10" x 36" Norton Type C Cam. Grdr.
10" x 48" Norton type C (1943)
Hill-Clarke Cylindrical Grinders
10" x 36" centers
10" x 72" centers
18" x 96" centers
24 x 32 Gap x 144" centers
14" x 36" centers
14" x 72" centers
14" x 96" centers
18" x 96" centers
24" x 264" centers
No. A-3—12" Arter Rotary Surf.
No. 1109 Bryant Internal Grd. (1951) (9" swing — 1" bore x 3½" grind stroke)
No. 5 Bryant Internal Grd.
No. 5B Bryant Internal Grd.
No. 16-16 Bryant Internal Grd.
No. 16-A-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 16 A-28 Bryant Internal Grd.
No. 16 F-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 24-36 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

YOUR WORN MACHINES CAN BE "NEW" AGAIN

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CONSULT US ABOUT REBUILDING YOUR OWN MACHINES

BORING MACHINES

No. 45—4½" bar G & L Hor. Bor.
100" Niles-B-Pond Vert. Bor., Mill

LATHES

16" x 33" R-14 Seneca Falls Auto Lathe
18" x 6' American Geared Head Lathe
18" x 8' Lodge and Shipley
19" x 8' LeBlond Hvy. Duty Lathe
27" x 12' American Geared Hd. Lathe
27" x 12' centers LeBlond Lathe
36" x 18' Putnam Grd. Hd. M.D.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7½" Hole Spdl.
No. 4A Warner & Swasey, Taper, Cross-Slide (1944)
No. 4A Warner & Swasey, Taper, Cross-Slide (1942)

MILLING MACHINES

No. 08 Cincinnati Vert. Mill (1942)
54" x 30" x 16' Ingersoll Slab Mill
6" x 168" Pratt & Whitney Thrd. Mill
10" x 48" Hanson-Whitney (1942)
10" x 60" Pratt & Whitney Thrd. Mill
12" x 102" Lees-Bradner Thrd. Mill

PLANERS

36" x 36" x 12' Cincinnati, 2 hds.
48" x 36" x 14' Gray, 2 hds.
48" x 48" x 12' Cincinnati, 2 hds.
60" x 48" x 27' American, 4 hds.

MISCELLANEOUS

1"-2" Cap. Micro. Model 200 Hor. Hone
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
3 Ton Fox Hydraulic Press
2—12" x 96" Magnetic Chucks
20' x 1" cap Southwark Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)

FULL MONEY-BACK GUARANTEE

1. Hill-Clarke always give you an unconditional money-back guarantee.
2. All machines in stock.
3. You can see your machine run and tested under power in our plant before purchasing.
4. Complete and modern facilities plus experienced craftsmen for REMANUFACTURING machine tools in our 58,000 sq. ft. plant.
5. A responsible organization — established 1867.

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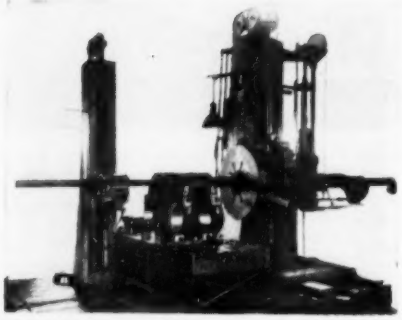
DEPENDABLE LATE TYPE MACHINES

WITH A NOLL GUARANTEE

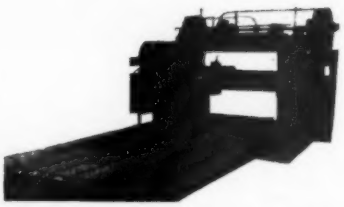


NILES 6½" FLOOR TYPE BORING MILL

with Floor Plate, Outboard Support & Electrics. Motor: 25 HP. 250V DC 400-1200 rpm. "V" Belt Drive.

SPECIFICATIONS

6½ Diameter bar with 50" travel. 13' High column. 12' Travel. 14'x14' Floor Plate with "T" slots.



ROCKFORD D.H. PLANER

84 x 60" x 18'

MOTORS: 25 hp 3/60/220V—425-860 rpm.

SPECIFICATIONS: 2 Rail heads, 1 R.H. Side head, Bed size—19' long x 5'2" wide, plus 20" piece added to width.

WRITE FOR COMPLETE STOCK LIST
WRITE, WIRE OR PHONE EXPRESS 1-0700

NOLL EQUIPMENT CO.

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NEW LIFE *for* **OLD MACHINES**

Perfection and Quality!

Worcester Automatic Rebuilding Company can rebuild your old machine for long life and accurate operation. Special facilities plus experience assures both excellent workmanship and efficient handling of your equipment.

We take your old machine, strip it down to the bare casting—clean it—replace worn parts and refinish sliding surfaces like new again. All machines are carefully tested and guaranteed.

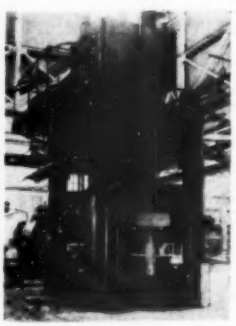
Send us a list of your machines that need rebuilding to meet new problems. We will be glad to quote phase 1 and 2. Write to address below and we will promptly reply.

WORCESTER AUTOMATIC REBUILDING COMPANY

91 WEBSTER ST., WORCESTER 3, MASS.

H.P.M. 2500 TON FASTRAVERSE HYDRAULIC PRESS

Age 1943



4 Columns—12" diameter

2 Pull-backs—8" diameter

Stroke 42" (any stroke up to 42")

Daylight 84"

Bed area 72" F to B x 97" L to R between posts in clear

Ram area 72" F to B x 97" R. to L.

Bolster, plate 72" x 97"—8" thick

plus additional Bolster, smaller—6" thick.

Diameter of Cylinder approximately 42".

Line pressure operation—2650 lbs. per inch.

Strokes per minute—5

Complete with Pump and G.E. Motor—100 HP 3/60/440 AC

Complete with controls, push-button operation.

Semi-automatic, automatic.

Overall height—24' from floor.

Depth in pit approximately 2'.

In operation. *Immediate Delivery.*

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408 Atlantic Ave. Brooklyn, N. Y.

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1941-1953 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CENTERING MACHINES

SWEDISH: Double-End, 42" & 60", new

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New) automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
RADIAL DRILLS: Archdale, 5', 6' and 7', new

GEAR CUTTING MACHINES

CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Geear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10" x 24" Hydr. Spur Gears and Splines
INTERNAL GEAR GRINDER, GG-31

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 10"x18" 45° angle wheel

3-WAY GUARANTEE

1. Should any machinery purchased from us prove unsatisfactory, you can return the machines within 30 days, via freight prepaid to our plant, and a full refund will be made.
2. Machines at our plant can be demonstrated and tested under power before purchasing.
3. You are dealing with a well-established, highly-rated firm of machinery engineers with over 33 years of proven responsibility.

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
INTERNAL GEAR GRINDER, GG-31

GRINDERS—INTERNAL

BRYANT: 16-16 Internal Hydraulic
BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

THOMPSON: Hydr. Surface Grinder, 10 x 18 x 24" New

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers and one extra multiform wheel dressing attachment

HONING MACHINES

MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
TRIPLEX Tool Room Lathe, 14"x60", new

LATHES—TURRET

WARNER & SWASEY: 1A, 2A, 3A & 4A
WARNER & SWASEY #3, #4 & #5 Turret Lathes
HERBERT: #0, #2, #4, #7, #8 and #9B/30 Sizes, new
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

CINCINNATI Hydromatic Duplex, Rise-and-Fall, 34-36 Tracer Control
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
EES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole.
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

ARTER CARBIDE Tool Grinders
OPTICAL PROFILE GRINDER, Wickman, New
OPTICAL PROFILE GRINDER, Sheffield, used.
AUTOMATIC SCREW MACHINE, Swiss type, ⅜"—used
AUTOMATIC SCREW MACHINE Wickman, Single Spindle, 7/16", New
CUTOFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
EST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe 12" dia. x 48" centers
HARDNESS TESTER: Gogan Brinell, Model 16-8
SHEFFIELD Precisionaire Gauge
SWEDISH, Double-End, 42" & 60", new
WIRE FORMING MACHINES: 4-slides (new)

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MACHINE TOOL ENGINEERS SINCE 1919

HEADLINERS

GEAR MACHINERY

No. 96-H Gould & Eberhardt Automatic Universal Hobber, a.c. m.d.

No. 18-H Gould & Eberhardt Automatic Universal Hobber, a.c. m.d.

No. 18-HM Gould & Eberhardt Double Spindle Hobber, s.p.d.

No. 12 Barber-Colman Hobber, s.p.d.

Rhenania Hobber, cone drive, capt. 28"

No. 2 Barber-Colman Hobber, a.c. m.d.

No. 1 Adams Farewell Hobber, a.c. m.d.

No. 5-A Cincinnati Cutter, 60"x16", 2 DP steel, a.c. m.d.

No. 3—26" Brown & Sharpe Cutter, a.c. m.d.

6", 11" & 18" Gleason Bevel Generators

No. 7 Fellows High Speed Shapers

TURRET LATHES

No. 2-L Gisholt, a.c. m.d., Timken, hard ways, cross-sliding turret

No. 1-A Warner & Swasey Universal Hollow Hexagon, a.c. m.d. Timken, covered ways

No. 601 Oster "Rapiduction"

RADIAL DRILLS

4'-11" col. Cincinnati-Bickford, a.c. m.d.

5'-13" col. Dreses, cone drive

6'-16" col. Dreses Full Universal, a.c. m.d.

7'-17" col. Dreses, a.c. m.d.

MILLING MACHINES

No. 36 Van Norman Ram Type, a.c. m.d., No. 50 taper, dividing heads, arbor, arbor support, new 1942

No. 1-14 Kent-Owens Hydraulic, a.c. m.d., No. 40 taper, new 1941

No. 4 Cincinnati "High Power" Rectangular Overarm Plain, a.c. m.d., power rapid traverse

No. 4 Cincinnati "High Power" Universal, a.c. m.d., dividing heads

No. 4-B Brown & Sharpe Heavy Plain, a.c. m.d.

MISCELLANEOUS

No. 12-B Pratt & Whitney Single Spindle Profiler, a.c. m.d., like new

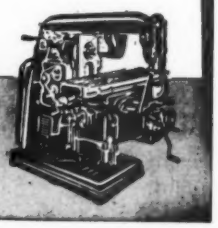
A-1-8 Arter Rotary Surface Grinder, ac. m.d., new 1943

10"x48" Landis Type C Plain Hydraulic Grinder, a.c. m.d., new 1942

24" Bullard "New Era" Vertical Turret Lathe, a.c. m.d.

1¼" Cone 4-spindle Automatics, a.c. m.d., bar feed

Many other machines in stock. Send us your inquiries.



COX MACHINERY COMPANY, INC.

3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1; OHIO

Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

2" Model A Cleveland. 1941.
1-1/16" Model A Cleveland. 1943.
No. 00G Brown & Sharpe. 1941.
No. 0G Brown & Sharpe 1941

BROACHES

HP-100 La Pointe Horiz. Broach. 1943.

DRILLS

3'-11" Archdale Radial. 1947.

GEAR EQUIPMENT

No. 7 Gleason "Revex" Rougher. 1943.
No. 6 Gleason Revacycle Generator. 1940.
No. 72 Fellows H.S. Gear Shaper. 1942.
No. 61 Fellows Gear Shaper. 1942.
10" Pratt & Whitney Hyd. Gear Grinder. '42
SG-11 Georgrind Spline Grinder. 1942.

GRINDERS

10"x18" Norton Plain Type "C". 1940.
6"x30" No. 12 B & S Hydraulic. 1940.
No. 72A-3 Heald Int. Extended Base. 1942
No. 72-A3 Heald Plain Hydraulic. 1942.
No. 24-36 Bryant Hydraulic. 1943.
No. 16A2B Bryant Hole & Face. 1942.
No. 172 Heald Hydraulic. Gap. 1940.
A3—16" Arter Rotary 1943
No. 24D Hanchett Duplex Rotary. 1945.
No. 16A Blanchard Auto. Surface. 1942.
No. 2 Cincinnati Centerless Grinder. New 1944.
Cincinnati Centerless Lapper. 1942.
HRS Barber-Colman. 1942.
No. 35 Excello Precision Thread. 1942.
No. 7 Grand Rapids Universal. 1942.
No. 1 Brown & Sharpe Univ. 1940.

GUN BARREL MACHINES

No. ½ B x 30 P & W Reamer. Latest.
No. ½ B x 30 P & W Reamer. Latest.
No. ½ B x 30 P & W Rifler. Latest.

LATHES, ENGINE

27"x192" Niles Timesaver. 2 Carr. 1941
27"x96" Niles Timesaver. 1940.
26"x180" Betts Bridgeford. 1940.
26"x96" Betts Bridgeford. 1940.

LATHES, PRODUCTION

8"x84" Lo-Swing Semi-automatic. 1941.
No. 3A Lodge & Shipley Duomatic. 1942
No. 1FU Foster Fastermatic. 1942

LATHES, TURRET

36" Bullard VTL, Spiral Drive. Late.
No. 1L Gisholt Saddle Type. Late.
No. 2A Warner & Swasey Saddle Type. 1940
No. 3R Gisholt Universal Saddle Type. 1943.
No. H3 Libby Universal Saddle Type. 1939.
No. 3 Gisholt Universal Ram Type. 1942.
No. 4 Gisholt Universal Ram Type. 1940.
No. 2M-50 Warner & Swasey Ram Type. 1941.

MILLS, BORING

No. 41 Lucas Horiz. 1941.

MILLS, PRODUCTION

No. 1-18 Cincinnati, 1942.
No. M-18 Milwaukee. 1943.
M-18 Milwaukee. 1943.
No. 3 Cincinnati Univ. Dial Type.
No. 00 CINCINNATI Rise and Fall. 1942
6x16 Hanson-Whitney Thread. 1939.

MILLS, TOOL ROOM

No. 3 Van Norman Plain. 1942.
No. 22L Van Norman Plain. 1943.
No. 2 Saimp Vertical New.
No 2 Saimp Universal. New.
No. 3 Saimp Plain & Vertical. New
No 4 Saimp Vertical. New.

PRESSES

Versen 650 Ton Double Action. 1940
No. 168½ Toledo Toggle.
No. 166 Toledo Toggle.
No. 67 Bliss Consolidated Press

SHAPERS

12" Ohio Heavy Duty Univ. 1951
16", 20", 24" Gornetti Universal Shaper. New.

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No. 172 HEALD Gap Internal Grinding Machine for large swing
6"x18" LANDIS Type C Plain Grinder
10"x72" LANDIS Type C Hydraulic Plain Grinder —1942
Nos. 4D & 6S POTTER & JOHNSTON Automatic Lathes
Nos. 8A and 9A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes
No. 26 VAN NORMAN Universal Miller
No. 3 CINCINNATI Dial Type Plain Miller
No. 2 CINCINNATI HS Dial Type Plain Millers
No. 5 CINCINNATI Plain High Power Miller
No. 0-8 CINCINNATI Plain Milling Machines
No. 2M CINCINNATI Vertical Miller, 1941
No. 1-18 CINCINNATI Plain Mfg. Miller
No. 12 B&S Plain Bed Type Production Miller
6"x60" P&W Model C Thread Miller
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver 1943
No. 36BM GOULD & EBERHARDT Gear Rougher
16/20" GOULD & EBERHARDT Industrial Shaper
36" OHIO "DREADNAUGHT" H.D. Shaper.
100" BETTS Vertical Boring Mill, 2 heads.
50-ton HENRY & WRIGHT Dieing Machine, 1948.

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Brown & Sharpe (8) Model 0G, ⅜" capacity
Brown & Sharpe (5) Model 00G, ⅜" capacity
Brown & Sharpe #4 Automatic New 1939
Ceco Screw Machine ⅜" capacity.
Cleveland Model AA-11, Serial #36586.
Cleveland Model B. Serial #42618/843.
Cleveland B18—1½" Cap. Late.
Conomatic 4 Spindle, Serial #2309FF, 1½".

BORING MILLS
Bullard 24" V.T.L. Spiral Drive
Bullard 8"—8 spindle, Multi-Matic
Cleveland 2½" Bar Capacity
Giddings & Lewis #32, 3" #25, 2½" Bar.
Kings 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mill

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American 6'x15" Universal, 4'13", 3'9"
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, #16—4 Sp.
Buffalo: Power No. 41, No. 42, RPMSTERS
Canedy-Otto 21" Sliding head, New
Cincinnati Bickford 6'x15" col.
Edlund 8" Model 2B, Sliding Head
Natco #12, 20 spindle Model B2A—10 Sp.
24" Sibley Sliding head
New Geared Box Col. Drills 24"
Foote-Burt #25 3" capacity
Leland Gifford 2 LMS, 3 MS
Leland Gifford No. 2—4 Sp. Hyd. Feeds
Sigourney 2 spindle

ENGRAVERS
Gorton #ME, 1D, 3U, 3Z, Deckel G1L, G1, G2
Taylor-Hobson 3 dimensional Pantograph
New, 3 dimensional Deckel type

GEAR EQUIPMENT
Barber-Colman Mod. SHS, Sharpener
Barber-Colman #2, #12 (3) also Type S.
Brown & Sharpe #3 Gear Mill, 26" Cap.
Cleveland Rigidhobber Mod. 140.
Fellows High Speed Shapers 712, 725, 71, 7
Fellows #20M Redliner, Flather 72" Cutter
Gleason Gear Rougher, Gleason #6 Power Tester
Gleason #2 Surface Hardener, No. 3 Gear Tester
Gleason #3 Spiral, #3 Straight Bevel
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
Mikron No. 79 Gear Hobbers
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS SURFACE
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Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Brown & Sharpe #5, #2 with Chuck
Gallmeyer & Livingston—65
Heald 22—12" chuck, Arter 12", Covel No. 15
Portman 12" Chuck Rotary—Reid #3, 11"x36"
Pratt & Whitney 12x36" Vertical
Taft Pierce #1 Precision

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300 Ton Watson & Stillman 24x29"
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Brown & Sharpe #5, 3"x18" Cylindrical
Brown & Sharpe #13 Universal Tool & Cutter
Bryant #5 Internal, chucking
Cincinnati 6x18" Hyd. #4—Centerless—#2
Douglas Tool & Cutter 8"x15"
Gardner Disc Grinder 30"—15 H.P. Motor
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder Mod. 375-2
Heald #73 Internal Centerless, #75A Internal
Heald 72A3 Int. Centerless Sizematic
J. & L. Thread; TG615, Lempco 54" Swing
Landis 6"x30" Type C Cyl., 10x24 Univ. 12x30
Norton #2 Tool & Cutter, No. 1 Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 10"x18" Type C cylindrical, 6"x30" Cyl.
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6-G Drill Grinder, 6G Tool, K.O. Lee tool
Van Norman #666 Crankshaft

LATHES
American 12"x30", Bridgeford 36"x20", 32"x16'
Bertram 26"x10'
Boyes & Emmes—24" G.H.—Bradford 16"x36"
Gisholt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42" and 12x30", 1941, 14" Yoke
LeBlond Regal 10"x3' bed, 13x42"
LeBlond 25/50x96" Gap, Late type.
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, Duomatics
Pratt & Whitney 16"x60, 10"x20", 16"x36
Monarch Magna-matic 14"x54"
New 16, 18, 20", 28" Immediate Del.
New Tool Maker 10x24", South Bend 9"
Rivet jet 918 Precision. Mod. 715
Putnam, sliding Gap 22"/46"x92"
South Bend 13"x5' Q.C.G., 10"x5 Q.C.G.
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.
New #2, Univ., Dividing Hd.
Brown & Sharpe #0 Omniversal, #000 Production
Brown & Sharpe #2B Plain, No. 2, 3A, 21, #2L
Cinn. 08 Rise & Fall 2-24 Automatic
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens IV, 1-8, 1-14, 1M, 2-20
Kempsmith #1 Pl., Vert. & Div. Hd
Milwaukee 2H Universal, 2H Plain
Milwaukee #2B, Plain & Univ.
Nichols Horiz. Hand and Pneumatic Feed
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach. 33
Van Norman #2L Univ., Dividing Head
Van Norman No. 12

MILLS, VERTICAL
Cincinnati (2)—1-18 Plain Automatic
Cincinnati #3, 08 Vertical
Cleveland No. 1 table 8"x32"
Gorton 8D Super Speed
Morey #12M Profiler, 2 sp. #2 Maximiller
New Manex 8"x24"
Reed Prentice Vert. Mill & Die Sinker Mod. 3VG
Taylor & Fenn Vert. 6"x18"

PRESSES
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Bliss 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss 5-48 Dbl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
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Niagara A1¾, O.B.I., Niagara No. 27
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Z & H #4½, O.B.I. 20 Ton

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Brown & Sharpe, #2 Hand, #10, 11
Foster #2B 2½ Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur.
Gisholt #5, Bar Feed, Plenty of Tools
Gisholt 4R—9¼" hole in spindle
Libby 1 HS with threading att.—3R 4R
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1, 1A, 2, 2A, 3, 4, 5

MISCELLANEOUS
Band Saw: New Kalamazoo & Johnson
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Broach: New 6 Ton. Horizontal. 11 Ton. Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Jig Borers: New Swiss
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CLEVELAND model "A", 8", M.D., late
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ARTER 8" Rotary, motor drive
BLANCHARD #18 Vert. Rotary, 30" chuck; late
BILLITER & KLUNZ 46"x196" Way, Gdr. M.D.
HEALD No. 22 Rotary, 12" chuck; M.D., late
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KEARNEY & TRECKER 4H Plain, Timken, late
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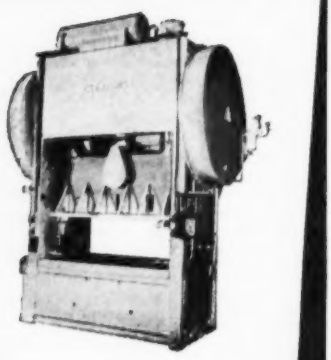

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Index of

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In This Issue

Abrasives, Coated 27, 225, 238
Abrasive, Diamond (Not Bonded) 228
Accessories & Attachments (Machine Tool) 58, 98-99, 110, 195, 236, 258, 268, 271, 280

Bearings ..... 4th Cover, 206-207
Bending Machines 278
Books, Technical 264
Boring, Drilling & Milling Machines (Horizontal) 14-15, 34-35, 38-39, 106, 255
Boring Machines Internal ..... 2nd Cover
Boring & Turning Machines (Vertical) 14-15, 34-35, 38-39, 93, 100
Broaching Machines 253
Brushes 181

Cams 262
Castings 213
Centrifugal Machines 254
Chucks 224, 278
Cleaning & Drying Machines & Supplies 270
Coolant Systems, Filters & Supplies 276
Cut-Off Machines 30-31, 222, 254, 258
Cutters, Abrasive 227

Diamond Wheels 216
Disintegraters, Metal 156
Dressers 98-99
Drilling Machines ..... 56-57, 64, 74-75, 81, 91, 110, 187, 189, 202. Insert Bet. 212-213, 246-247, 255, 268, 274, 279, 280
Duplicators & Pantographs 73, 237, 256-257

Electro Plating & Polishing Equipment & Supplies 234, 259
Engineering & Production Services 59

Fabricating Methods & Services 258
Fasteners 28, 80, 92, 251, 266, 272
Floor Drying Compounds 200
Forgings 219, 269

Gages & Instruments ..... 16, 84, Insert Bet. 32-33, 178-179, 191, 203, 217, 226, 262, 272

(Continued on page 300)

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Index of PRODUCTS ADVERTISED

In This Issue

•

(*Continued from page 299*)

Gear Cutting Machines ... 6-7, Insert Bet. 32-33, 54, 253
Gears, Speed Reducer, Motor Reducers ... 69, 201, 250
Gear Testers ... 6-7, Insert Bet. 32-33
Grinders—Cutter & Tool ... 12-13, 18-19, 52-53, 68, 94
Grinding Machines—Production ... 8-9, 12-13, 18-19, 29, 52-53, 66, 68, 78, 90, 96, 114, 255, 277
Grinding Wheels ... 18-19, 27, 29, 86-87, 198, 220

Heads: Drilling, Grinding & Tapping ... 95, 230, 266, 268, 274
Heat Treating Equipment & Supplies ... 26, 55, 261, 265, 278
Honing Machines ... 104, 267, 280
Hydraulic & Pneumatic Parts & Equipment ... 185, 271

Jig Borers ... 89, 276

Lapping Machines ... 263
Lathes, Automatic ... 3rd Cover, 22-23, 68D
Lathes, Engine ... 37, 60-61, 73, 82, 113, 183, 224, 229, 249, 256-257, 260
Lathes, Turret ... 38-39, 42, 49, 68D, 255, 266, 275, 280
Lubricants, Cutting Fluids, Quenching Oils & Solvents ... 33, 43, 160, 193, 231
Lubricating Systems & Equipment ... 211

Machines, Super Finishing ... 68D
Marking Machines, Tools, & Supplies ... 212, 280
Materials, Cutting & Forming ... 36, 67, 70-71, 162, 197, 209, 222, 235
Materials of Manufacture ... 3, 70-71
Materials Handling Equipment ... 264
Millers, Die Sinkers, Profilers ... 4-5, 20-21, 77, 82, 218, 223, 252, 255, 256-257
Motors, Electrical ... Insert Facing 36

Index of

PRODUCTS ADVERTISED

In This Issue

Nibbling Machines 227

Oil Purifiers 76

Planers 14-15, 106
Power Transmission 17, 62-63, 248
Presses, Forging & Forming Equipment & Supplies 30-31, 34-35, 46, 50, 83, 85, 210, 232, 245,, 252, 258, 262, 268, 275, 280
Production, Inventory & Tool Control 241
Pumps, Circulating 226, 252

Riveting Machines 254

Safety & Welfare Equipment 244, 254
Saw Blades 48, 204-205, 235, 280
Sawing Machines 48, 155, 233, 262, 264, 272
Screw Machines; Chucking Machines 65, 82, 208
Shapers, Slotters, Keyseaters 44-45, 116, 228, 260, 262, 268
Special Machine Tools 59, 155, 239, 275
Swaging Machines 220

Tapping Attachments 158, 266, 268, 273
Tapping Machines 56-57, 74-75, 189, 246-247, 266, 273, 279, 280
Thread Cutting Machines 10-11, 54, 66
Tools, Cutting ..... 24-25, 32, 40-41, 44-45, 47, 51, Insert Bet. 68-69, 72, 79, 97, 102, 108-109, 214-215, 221, 270, 276
Tools, Hand 269
Tools, Measuring 88
Tools, Portable 242-243, 272
Tumbling Machines 240

Universal Joints 210
Used & Surplus Equipment 288-289

Vises 98-99, 260

Welding & Cutting, Brazing & Soldering Equipment & Supplies 55, 199

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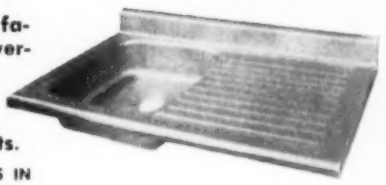

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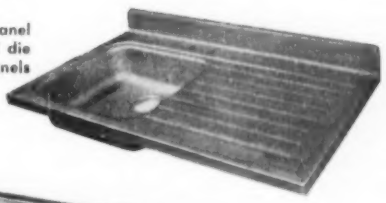

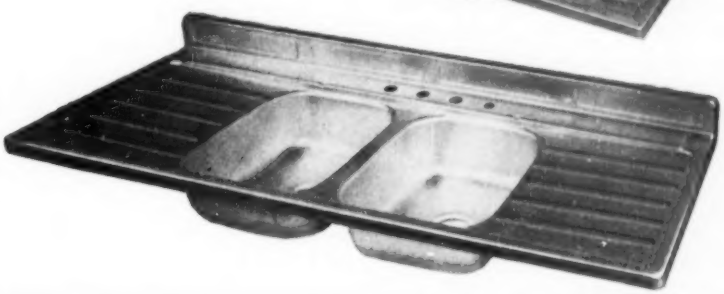

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ADVERTISERS INDEX

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Abrasive Products Inc.	225
Acme Gear Co.	250
Acme Industrial Company	282
Acromark Company	280
Affiliated Machine & Tool Co.	254
Alina Corporation	272
Allegheny Ludlum Steel Corp.	36
Allen Mfg. Co.	80
Allis-Chalmers Mfg. Co.	55
American Chain & Cable Co. Inc	227, 262
American Machinery Co. Inc.	218
American Optical Co.	244
American Steel & Wire Div.	3, 70-71
American Steel Foundries, King Machine Tool Division	100
American Tool Works	81
Ames Company, B. C.	217
Ames Precision Machine Works	272
Armour & Co. & Subsidiaries	238
Armstrong-Blum Mfg. Co.	48
Armstrong Bros. Tool Co.	58
Arrow Gear Co.	250
Atkins Saw Division Borg-Warner Corp.	204-205
Atrax Company, The	32
Austin Industrial Corp.	262, 264
Avey Drilling Machine Co.	110
Baird Machine Co.	275
Baker Bros., Inc.	279
Baldwin-Lima-Hamilton Corp.	34-35, 213
Barnes Co., W. F. & John	246-247
Barrett Co., Leon J.	254
Benchmaster Manufacturing Co.	252
Besly-Wells Corporation	277
Bethlehem Steel Co.	67
Bijur Lubricating Corp.	211
Bilgram Gear & Machine Co.	284
Black & Decker Mfg. Co.	242-243
Blake Co., Edward	300
Blanchard Machine Co.	78
Bliss Co., E. W.	85
Bodine Corp.	239
Boye & Emmes Machine Tool Co.	229
Bradford Machine Tool Co.	224
Brown & Sharpe Mfg. Co.	88
Bryant Machinery & Engineering Co.	89
Buck Tool Co.	224
Bullard Co.	93
Butterfield Div. of Union Twist Drill Co.	Insert Facing 68
Campbell, Andrew C. Div., American Chain & Cable Co. Inc.	227
Carboloy Dept. of General Electric Co.	108-109
Carborundum Co.	86-87
Card Mfg. Co., S. W.	Insert Between 68-69
Carpenter Steel Co.	264
Carroll & Jamieson Machine Tool Co.	299
Chicago Wheel & Mfg. Co.	220
Cincinnati-Bickford Tool Co.	91
Cincinnati Gear Co.	299
Cincinnati Lathe & Tool Co.	Insert Between 212-213
Cincinnati Milling Machine Co.	4-5
Cincinnati Planer Company	14-15
Cincinnati Shaper Co.	30-31
Cleereman Machine Tool Co.	89
Clinton Machine Co.	156
Columbia-Geneva Steel Div.	3, 70-71
Columbia Tool Steel Co.	222
Columbus Die-Tool & Machine Co.	258
Cone Automatic Machine Co.	65
Continental Tool Works Div. Ex-Cello-O Corp.	102
Covel Manufacturing Co.	68
Crane Packing Co.	263
Crucible Steel Co. of America	209
Curtis Universal Joint Co.	210
Davis & Thompson Co.	274
Davis Keyseater Co.	268
DeLaval Separator Co.	76
Desmond-Stephan Mfg. Co.	260
Detroit Milling Cutter Co.	286
Detroit Tap & Tool Co.	72
Dumore Co.	230
Du Pont de Nemours & Co. Inc., E. I. Electrochemicals Dept.	33
Eastern Machine Screw Corp.	268
Eastman Kodak Co., Optical Sales Div.	191
Eisler Engineering Co. Inc.	262
Elastic-Stop Nut Corp.	251
Electro-Lift Inc.	264
Erie Foundry Co.	219
Etco Tool Co.	273
Ex-Cell-O Corporation	102
Federal Products Corp.	Insert Between 178-179
Fellows Gear Shaper Co.	6-7
Felters Co.	200
Fisher Governor Co.	271
Ford Mfg. Co., M. A.	270
Gallmeyer & Livingston Co.	304
Gardner Machine Co.	29
Gates Rubber Co.	248
Gear Specialties, Inc.	69
General Electric Co., Apparatus Dept.	Insert Facing 36, 62-63
Giddings & Lewis Machine Tool Co.	14-15
Gisholt Machine Co.	6810
Gleason Works	Insert Between 32-33
Gorham Tool Co.	97
Gorton Machine Co., George	237
Goss & de Leeuw Machine Co.	208
Grant Mfg. & Machine Co.	254
Grav-I-Flo Corporation	240
Gray Co., G. A.	106
Graymills Corp.	276
Grob Brothers	262
Gulf Oil Corp.	231
Hanchett Manufacturing Co.	222
Hanson-Whitney Div. Whitney Chain Co.	259
Hardinge Brothers, Inc.	82
Hartford Special Machinery Co.	189
Heald Machine Co.	2nd Cover
Heller Machine Co.	77
Henry & Wright Div. Emhart Mfg. Co.	50
Hills (Patents) Ltd.	254
Hones, Inc., Charles A.	278
Hy-Pro Tool Co.	51
J & L Machinery & Supply Co.	262
J & S Tool Company	98-99
Johnson & Bassett Inc.	284
Jones & Lamson Machine Co.	12, 66
Kalamazoo Tank & Silo Co.	233
Kearney & Trecker Corp.	20-21, 59
Kempsmith Machine Co.	223
King Machine Tool Div. American Steel Foundries	100
Kingsbury Machine Tool Corp.	74-75
L & J Press Corp.	210
Landis Machine Co.	10-11
Landis Tool Co.	12-13, 52-53
LaSalle Steel Co.	197
LeBlond Machine Tool Co., R. K.	60-61
Lees-Bradner Co.	54
Lehmann Machine Co.	249
Leland-Gifford Co.	187
Lewthwaite Machine Co., T. H.	278

ADVERTISERS INDEX

	Page
Lindberg Steel Treating Co.	265
Link-Belt Co.	17
Linley Brothers Co.	276
Lipe-Rollway Corp.	236
Lodge & Shipley Co.	73
Luers, J. Milton	280
Machine Products Corp.	282
Marac Machinery Corp.	268
Massachusetts Gear & Tool Co.	250
M.B.I. Export & Import Ltd.	278
McCaskey Register Co.	241
McGraw-Hill Book Co., Inc.	274
Metalmaster Div. Clinton Machine Co.	156
Micromatic Hone Corp.	104
Mitchell Mfg. Co.	282
Mitts & Merrill	260
Moline Tool Co.	280
Monarch Machine Tool Co.	37
Morey Machinery Co. Inc.	260, 266, 270
Morris Machine Tool Co.	64
Morse Twist Drill & Machine Co.	24-25
Motch & Merryweather Machinery Co.	155
National Acme Co.	95
National Automatic Tool Co.	56-57
National Broach & Machine Co.	253
National Machinery Co.	281
National Machine Tool Co.	228
National Tool Co.	79
National Tube Div.	3
National Twist Drill & Tool Co.	41
Nebel Machine Tool Co.	113
New Britain Machine Co., The	3rd Cover
Nilson Machine Co., A. H.	232
Norton Company	18-19, 27
Oakite Products Inc.	270
Ohio Crankshaft Co.	261
Oliver Instrument Co.	94
Orban Inc., Kurt	38-39
Osborn Mfg. Co.	181
Ottemiller Co., Wm. H.	272
Parker-Kalon Corp.	28
Parker Machine Co., Inc.	280, 282
Parker Stamp Works, Inc.	212
Philadelphia Gear Works	201
Potter & Johnston Co. Sub. Pratt & Whitney Div. Niles-Bement-Pond	49
Pratt & Whitney Div. Niles Bement-Pond Co.	44-45, 214-215
Procunier Safety Chuck Co.	266
Ransburg Electro-Coating Corp.	234
Reed-Prentice Corp.	256-257
Reid Brothers Co. Inc.	96
Russell, Burdsall & Ward Bolt & Nut Co.	92
Ruthman Machinery Co.	226
Ryerson & Sons Inc., Joseph T.	162
S & S Machinery Co.	255
S.K.F. Industries Inc.	206-207
Schrader's Son, A.	185
Seneca Falls Machine Co.	195
Shear Speed Chemical Products Div. Michigan Tool Co.	43
Sheffield Corp.	114
Shore Instrument & Mfg. Co. Inc.	301
Sid Tool Company	276
Sidney Machine Tool Co.	183
Simonds Abra-sive Co.	198
Simonds Saw & Steel Co.	235
Smit & Sons Inc., J. K.	228
Socony-Vacuum Oil Co. Inc.	193
Sorenson Center-Mikes Inc.	226
South Bend Lathe Works	283
Standard Tool Co.	47
Stone Machinery Co.	258
Strassmann, K. G., Albert	286
Strong Carlisle & Hammond Co.	266
Struthers Wells Corp.	245
Sunnen Products Co.	267
Sun Oil Co.	160
Taft-Peirce Mfg. Co.	84
Tennessee Coal & Iron Div.	3, 70-71
Thompson Grinder Co.	90
Threadwell Tap & Die Corp.	221
Timken Roller Bearing Co.	4th Cover
Torrington Co.	220
Tuthill Pump Co.	252
Union Twist Drill Co.	Insert Bet. 68-69
U. S. Diamond Wheel Co.	216
U. S. Steel Co.	70-71
U. S. Steel Export Co.	70-71
United States Steel Supply Div.	70-71
U. S. Tool Co. Inc.	83
United Tool & Die Co.	301
Utica Drop Forge & Tool Corp.	269
V & O Press Co. Div. Emhart Mfg. Co.	46, 284
Vaill Engineering Co.	252
Van Keuren Co.	16
Van Norman Co.	8-9
Walker Co. Inc., O.S.	284
Waltham Machine Works	280
Walton Company	268
Warner & Swasey Co.	22-23
Webber Gage Co.	203
Westinghouse Electric Corp.	199
Westinghouse Electric Corp. Electronics Div.	26
Wickman Manufacturing Co.	158
Wilson Co. K. R.	36B
Wilson Mechanical Instrument Co.	262
Winter Brothers Co.	40
Worcester Gear Works Inc.	250
Zagar Tool Inc.	202
Zeh & Hahnemann Company	268

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT	Page
Positions Vacant	287
Selling Opportunities Offered	287
Positions Wanted	287
Employment Agencies	287
SPECIAL SERVICES	
Contract Work	288
Eastern Machine Screw Corp.	288
General Pattern Works	288
Michel Manufacturing Co.	288
Rebuilding	294
BUSINESS OPPORTUNITIES	
Wanted	288
EQUIPMENT	
(Used or Surplus New) For Sale	289-298
WANTED	
Equipment	288

ADVERTISERS INDEX

Aaron Machinery Co., Inc.	297
A. & J. Machinery Co.	297
Bennett Machinery Corp.	299
Botwinik Bros. of Mass. Inc.	290
Brownell Machine Tools Inc., Hazard	297
Cincinnati Machinery Co.	292
Cowden Machinery Co., W. C.	298
Cox Machinery Co., Inc.	296
Currier Machine Sales	292
Dayton Pump & Manufacturing Co.	288
DeWitt Equipment Co.	288
Dony Machinery Co., D. E.	296
Eastern Machinery Co.	291
Falk Machinery Co.	289
Hill-Clarke Machinery Co.	293
Hyman & Sons Joseph	298
Indianapolis Machinery & Supply Co.	296
Kings County Machinery Exchange	294
Lincoln Equipment Co.	298
Miles Machinery Co.	290
Morey Machinery Co.	298
National Machinery Exchange	290
Noll Equipment Co.	294
O'Connell Machinery Co.	292
Power Press Specialists	298
Spelchake Machinery Co.	298
Triplex Machine Tool Corp.	295
Wabash Employment Agency	287
Wigglesworth Industrial Corp.	296
Williams, Edward Hale	298
Winston Machinery Co., Inc.	292, 298
Worcester Automatic Rebuilding Co.	294

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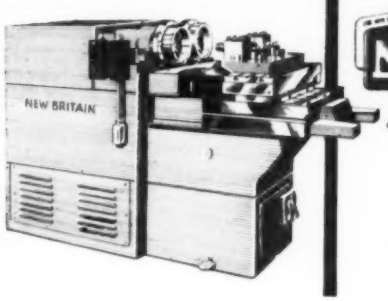

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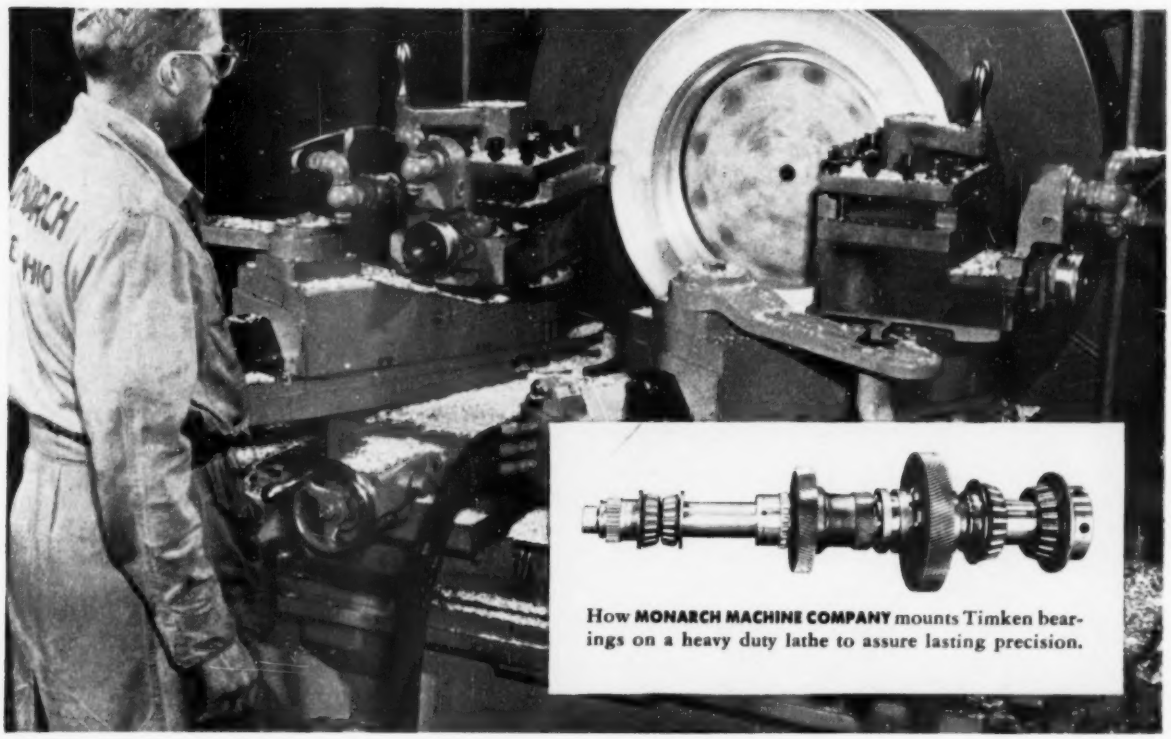

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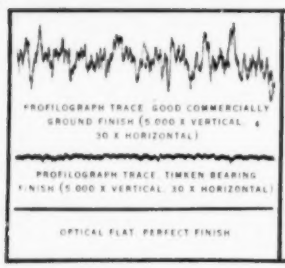
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